The Welding Engineer

Reg. U. S. Pat. Office

Founded by L. B. Mackenzie, 1916

SEPTEMBER, 1930 VOL. 15, NO. 9

$3.00 per year in U. S. 608 S. Dearborn St., Chicago, Ill. $4.00 per year abroad

OXWELDING

adaptable to any metal

Any commercial metal—steel, cast iron, practically all ferrous and non-ferrous alloys and non-ferrous metals—can be welded by the oxy-acetylene process.

Oxwelded joints are strong and tight—permanent and trouble-free. Wide adaptability to all kinds of metals and all sorts of equipment makes oxy-acetylene welding indispensable in every industrial plant.

THE LINDE AIR PRODUCTS COMPANY . . . . THE PREST-O-LITE COMPANY, INC. . . . OXWELD ACETYLENE COMPANY . . . UNION CARBIDE SALES COMPANY . . . UNITS OF

UNION CARBIDE UCC AND CARBON CORPORATION

General Offices . . New York Sales Offices . . in the Principal Cities 65 Linde plants . . . . 48 Prest-O-Lite plants . . . 174 Oxygen Warehouse stocks . . . 156 Acetylene Warehouse stocks . . . . 42 Apparatus Warehouse stocks . . . . 245 Union Carbide Warehouse stocks

We will exhibit National Metal Exhibition, Stevens Hotel, Chicago, September 22-26, 1930.

Published monthly by the Welding Engineer Publishing Co. Entered as second class matter Jan. 20, 1916, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

NOW—every length of Premier Welding Wire has the name and grade plainly stamped upon it. This means, not only the use of the *best* wire—but the unfailing selection of the *right* wire for every job to be done. All guess work has been eliminated—perfect results are assured every time.

Today—make sure of better work at less cost by specifying these free flowing, deeply penetrating and tested wires and electrodes. Write for samples and complete information. You will not be obligated.

PREMIER

TESTED

WELDING WIRES

AMERICAN STEEL & WIRE COMPANY

SUBSIDIARY UNITED STATES STEEL CORPORATION

208 S. La Salle Street, Chicago — 30 Church Street, New York

Other Sales Offices: Atlanta Baltimore Birmingham Boston Buffalo Cincinnati Cleveland Dallas Denver Detroit Kansas City Memphis Milwaukee Minneapolis-St. Paul Oklahoma City Philadelphia Pittsburgh Salt Lake City St. Louis Wilkes-Barre Worcester

Pacific Coast Distributors; Columbia Steel Company, San Francisco Los Angeles Portland Seattle Honolulu

Export Distributors: United States Steel Products Co., 30 Church St., New York City

The Welding Engineer

Founded by L. B. Mackenzie, 1916

Volume 15 | September, 1930 | Number 9

CONTENTS

Metal Week Has Much to Offer 45
Modern Arc Welding Practice 49
By J. M. Hipple and G. D. Fish
Pipe Welding in Buildings 55
By Charles Kandel and Charles M. Whalen
Pointers on Resistance Welding 58
By R. T. Gillette
Welded Steel Makes Better Punch Presses 61
Steel Shapes Cut to Order 65
Hints for the Welder 67
Everybody's Business 41
By Floyd W. Parsons
Editorial 43
New Brick Pavement Has Iron Base 48
Welded Fractionating Tower 54
Welded Boat of Tubing and Sheet Steel 57
Welded Tanker to Be Launched Soon 64
Welded Floor for Open-Hearth Building 64
Battledeck Floor for New Garage 66
New Products 70
New Literature 77
News of the Industry 80

Progress

IF the industry represented by the manufacturers of the machinery and materials used in the applications of the various welding processes has prospered during the past twelve months, then that prosperity has been well deserved. A year ago found these manufacturers invited to display their wares in new market places of attractive magnitude. Large industrial concerns of several kinds were getting interested and were asking to be shown how they could weld and what they would need in order to be well equipped. These same concerns are steady customers by this time, and others are just appearing as prospects. But increasing markets have not made the manufacturers of welding products satisfied with what they had to offer. Every request for improvement has apparently received a share of attention, with the result that many operating problems have been at least partly solved. Much of the information contained in the pages which follow bears upon things which have been wanted for years and have only recently been made available. The spirit which prompts manufacturers to give the public what it needs is the spirit of progress. The welding industry is bound to prosper as long as that spirit is kept alive.

Published on the 15th of Each Month by

THE WELDING ENGINEER PUBLISHING CO.
608 S. Dearborn St., Chicago, Ill.
Telephone WEBster 7134

G. H. Mackenzie ..... President and Treasurer
H. S. Card ..... Secretary

H. S. Card ..... Editor
F. L. Spangler ..... Managing Editor
C. T. Price ..... Associate Editor

Eastern Office—222 American Circle Bldg., New York. T. E. DePew, Eastern Manager. Telephone, Columbus 7843

Subscription payable in advance and postage free.
United States and possessions and Canada ..... $3 a year
Foreign Countries ..... $4 a year
Single copy, domestic ..... 25 cents
Single copy, foreign ..... 30 cents

Entered as second-class matter January 20, 1916, at the postoffice at Chicago, Illinois, under the act of March 3, 1879.

The Welding Engineer is a member of the Audit Bureau of Circulations and of the Associated Business Papers, Inc.

Last Advertising forms close at 8:00 a. m. on the 12th. To show proof for correction copy must be received at an earlier date and allowances should be made for delay to mails. All copy should be in by the 12th of the month at the latest.

The Welding Engineer does not publish in its news or advertising columns any matter that deals with or refers to either personal or legal controversies.

Authorized Representatives
CLEVELAND—R. K. Randall, 2261 E. 14th St.
DENVER—A. G. Odell, Public Opportunity School.
GREAT BRITAIN—Capt. D. Richardson, 26 Winterbrook Road, Herne Hill, London.
AUSTRALIA AND NEW ZEALAND—R. Hill, Matlock House, Davenport, Auckland, New Zealand.
SOUTH AFRICA—J. W. Arnison, 35a Victoria Ave., Benoni, Transvaal, South Africa.

Buyers' Index

Readers of The Welding Engineer will find this index to contain the most accurate information obtainable relating to welding apparatus and supplies. The advertising section includes the principal manufacturers of the United States.

ACETYLENE (Compressed in Cylinders)
Air Reduction Sales Co.
Commercial Acetylene Supply Co.
International Oxygen Co.
Prest-O-Lite Co.

ACETYLENE CYLINDERS
Pressed Steel Tank Co.

ACETYLENE WELDING WIRE
Air Reduction Sales Co.
American Brass Co.
American Steel & Wire Co.
Atlas Foundry Co.
Central Steel & Wire Co.
Chase Brass & Copper Co.
C. H. Dockson Co.
Fusion Welding Corporation
Haynes Steelite Co.
Hollup Corp.
Imperial Brass Mfg. Co.
Mueller Brass Co.
Oxweld Acetylene Co.
Page Steel & Wire Co.
Reid-Avery Co.
Roebling, John A., Sons Co.
Joseph T. Ryerson & Son, Inc.
Seneca Wire Mfg. Co.
St. Paul Welding & Mfg. Co.
Standard Steel & Wire Co.
Steel Sales Corp.
Stoody Co.
Taylor-Wharton Iron & Steel Co.
Torchweld Equipment Co.
Welding Service Co.
Weldit Acetylene Co.
Wickwire Spencer Steel Co.
Williams & Co.

ALUMINO-THERMIC WELDING
Metal & Thermit Corporation

ALUMINUM SOLDER
Crown Aluminum Solder Co.

ANNEALING FURNACES
General Electric Co.
Westinghouse Elec. & Mfg. Co.

APRONS (Asbestos)
Holcomb Safety Garment Co.
Ideal Face Shield Co.

ASBESTOS INSULATED WIRE AND CABLE
Central Steel & Wire Co.
Rome Wire Co.

BENCHES, WELDING
Oxweld Acetylene Co.
Standard Pressed Steel Co.

BLOW PIPES
See "Torches"

BOOKS
Electric Arc Cutting & Welding Co.
General Electric Co.
Haynes Stellite Co.
Lincoln Electric Co.
Linde Air Products Co.
Northwestern Mfg. Co.
The Welding Engineer Pub. Co.

BRAZING OUTFITS (Gas)
Air Reduction Sales Co.
Bastian-Blessing Co.
Craftsweld Equipment Co.
C. H. Dockson Co.
Harris Calorific Co.
Imperial Brass Mfg. Co.
International Oxygen Co.
K-G Welding & Cutting Co.
Lotan Research Corp.
Oxweld Acetylene Co.
Torchweld Equipment Co.
Victor Welding Equipment Co.
Williams & Co.

BRAZING OUTFITS (Electric)
Fusion Welding Corp.
General Electric Co.
Northwestern Mfg. Co.
Warner Engineering Corp.

BRONZE FILLER RODS
American Brass Co.
Bridgeport Brass Co.
Central Steel & Wire Co.
Chase Brass and Copper Co., Inc.
Imperial Brass Mfg. Co.
Lotan Research Corp.
Mueller Brass Co.
Oxweld Acetylene Co.
Steel Sales Corp.

BUFFERS
Keller Mechanical Engineering Corp.
N. A. Strand & Co.

BUTT WELDERS
See "Electric Resistance Welders"

CABLE (Arc Welding)
Allan Mfg. & Welding Co.
Central Steel & Wire Co.
Electric Arc Cutting & Welding Co.
Fusion Welding Corp.
General Electric Co.
Hobart Bros.
Hollup Corp.
Lincoln Electric Co.
Northwestern Mfg. Co.
John A. Roebling's Sons Co.
Rome Wire Co.
Joseph T. Ryerson & Son, Inc.
Westinghouse Elec. & Mfg. Co.
Wilson Welder & Metals Co.

CARBIDE
Air Reduction Sales Co.
National Carbide Co.
Shawinigan Products Corp.
Union Carbide Sales Co.

CARBON (Blocks, Paste, Electrodes, etc.)
Air Reduction Sales Co.
Central Steel & Wire Co.
Electric Arc Cutting & Welding Co.
National Carbon Co.

CARBON BURNING EQUIPMENT
Air Reduction Sales Co.
Bastian-Blessing Co.
C. H. Dockson Co.
Harris Calorific Co.
Imperial Brass Mfg. Co.
International Oxygen Co.
Kansas City Oxygen Gas Co.
K-G Welding & Cutting Co.
Oxweld Acetylene Co.
Torchweld Equipment Co.
Victor Welding Equipment Co.

CAST IRON SOLDER
Crown Aluminum Solder Co.

CAUSTIC POTASH
Innis, Speiden & Company

CUTTING ELECTRODES (Electric Arc)
Allan Mfg. & Welding Co.
Arcway Equipment Co.
Electric Arc Cutting & Welding Co.
Fusion Welding Corp.
General Electric Co.
Lincoln Electric Co.
National Carbon Co.
Westinghouse Elec. & Mfg. Co.
Wilson Welder & Metals Co.

CYLINDERS (Acetylene)
Pressed Steel Tank Co.

CYLINDERS (Oxygen, Hydrogen)
Harrisburg Pipe & Pipe Bending Co.
Wm. Wharton, Jr., Co.

DRILLS, PORTABLE ELECTRIC
Keller Mechanical Engineering Corp.
Stoody Company
N. A. Strand & Co.

ELECTRIC ARC WELDING OUTFITS
Allan Mfg. & Welding Co.
American Steel Engineering Co.
Arcway Equipment Co.
Burke Electric Co.
Electric Arc Cutting & Welding Co.
Electric Welding Machine Co.
Fusion Welding Corporation
General Electric Co.
Goodman Electric Machinery Co.
Hollup Corp.
Hobart Bros.
Lincoln Electric Co.
Northwestern Mfg. Co.
Owen Electric Mfg. Co.
Joseph T. Ryerson & Son, Inc.
Service Company
Stoody Co.
Welding Service Co.
Westinghouse Elec. & Mfg. Co.
Williams & Co.
Wilson Welder & Metals Co.

ELECTRIC BRAZING OUTFITS
See "Brazing Outfits, Electric."

ELECTRIC RESISTANCE WELDERS
Agnew Electric Welder Co.
American Transformer Co.
Federal Machine & Welder Co.
General Electric Co.
Goodman Electric Machinery Co.
Micro Products Co.
Joseph T. Ryerson & Son, Inc.
Service Company
Taylor-Winfield Co.

ELECTRODES (Carbon Arc Welding)
See "Cutting Electrodes"

ELECTRODES (Metallic Arc Welding)
American Steel & Wire Co.
Arcway Equipment Co.
Atlas Foundry Co.
Central Steel & Wire Co.
C. H. Dockson Co.
Electric Arc Cutting & Welding Co.
Fusion Welding Corporation
General Electric Co.
Hollup Corp.
Lincoln Electric Co.
Page Steel & Wire Co.
Reid-Avery Co.
Roebling, John A., Sons Co.
Joseph T. Ryerson & Son, Inc.
Seneca Wire & Mfg. Co.
Standard Steel & Wire Co.
Steel Sales Corp.
Stoody Company
Taylor-Wharton Iron & Steel Co.
Welding Service Co.
Wickwire Spencer Steel Co.
Williams & Co.
Wilson Welder & Metals Co.

ELECTRODE HOLDERS
Allan Mfg. & Welding Co.
Arcway Equipment Co.
Burke Electric Co.
C. H. Dockson Co.
Electric Welding Machine Co.
Fibre-Metal Products Co.
Fusion Welding Corporation
General Electric Co.
Hobart Bros.
Hollup Corp.
Lincoln Electric Co.
Northwestern Mfg. Co.
Owen Electric Mfg. Co.
Stoody Co.
Westinghouse Elec. & Mfg. Co.
Williams & Co.
Wilson Welder & Metals Co.

ELECTRODE TIPS (Resistance Welding)
Elkon, Inc.

ELECTROLYTIC OXYGEN AND HYDROGEN GENERATING EQUIPMENT
International Oxygen Co.

ENGINEERING SERVICE
Welding Engineering and Research Corp.

FACE SHIELDS (Arc Welding)
Allan Mfg. & Welding Co.
Arcway Equipment Co.
Burke Electric Co.
Central Steel & Wire Co.
Duff-Hall Goggle Service.
Electric Arc Cutting & Welding Co.
Fibre-Metal Products Co.
Fusion Welding Corporation
General Electric Co.
Hobart Bros.
Hollup Corporation
Ideal Face Shield Co.
Lincoln Electric Co.
Northwestern Mfg. Co.
Owen Electric Mfg. Co.
Stoody Company
Joseph T. Ryerson & Son, Inc.
Westinghouse Elec. & Mfg. Co.
Williams & Co.
Wilson Products, Inc.
Wilson Welder & Metals Co.

FIREPROOF PLASTIC MATERIAL
Air Reduction Sales Co.
National Carbon Co.

FLANGES, WELDING
Bonney Forge & Tool Works

FLUE WELDERS (Electric)
Federal Machine & Welder Co.
General Electric Co.
Joseph T. Ryerson & Son, Inc.
Taylor-Winfield Co.

FLUXES
Air Reduction Sales Co.
Anti-Borax Compound Co.
Bastian-Blessing Co.
Central Steel & Wire Co.
C. H. Dockson Co.
Imperial Brass Mfg. Co.
International Oxygen Co.
Lotan Research Corp.
Metal & Thermit Corp.
Oxweld Acetylene Co.
St. Paul Welding & Mfg. Co.
Torchweld Equipment Co.
Weldit Acetylene Co.

GAS SAVING DEVICES
Bastian-Blessing Co.
Harris Calorific Co.
Weldit Acetylene Co.

GLOVES
Holcomb Safety Garment Co.
Ideal Face Shield Co.
Oxweld Acetylene Co.
Pulmosan Mfg. Co.

EVERYBODY'S BUSINESS

BY FLOYD W. PARSONS

WE should now keep in mind the remarkable recuperative powers of the United States as demonstrated repeatedly in the past. Ten years ago during a business slump wages fell off nearly seven billion dollars in a single year, and yet out of this era of widespread fear and distress we advanced rapidly into a time of record-breaking expansion. Not since the turn of the present century has there been any exception to the rule that a severe decline in trade and industry lasts no more than 15 months.

What's Coming?

It appears that the long-awaited upturn in business has finally come. Trade indicators published by the government and by economic agencies reached their low points in July or early August. The index of commodity prices touched bottom on July 19. Since then electrical power production has increased, business activity as measured by bank debits has risen more than 18%, the demand for electrical equipment has grown, the average price of crude petroleum has risen, exports of farm machinery have gone ahead of 1929, and railroad orders for new locomotives and cars are also in excess of those of last year.

Business sentiment is more cheerful. Fear is commencing to give way to confidence. Bad news has become less of a shock and a chastened public is no longer inclined to run to foolish extremes of optimism. Mr. Ford and others are expressing the opinion that the decade just commencing will be filled with developments of greater interest and importance than America has ever known.

The principal elements of the business depression have now become so patent that any further discussion of them is mere repetition. It is not today but tomorrow that should hold our attention. What has become of the big projects and the revolutionary changes that were under way when the panic of last summer upset our plans? What of the mergers that were in the making? What has happened to the programs of our comparatively new institutions, such as the chain-store?

People talk a lot about the distressing conditions in Europe. Let us not forget that the United States is the flywheel that governs the machinery of world business. It is the most important factor in removing as well as developing international business cycles. Our national income is greater than the combined total of all other nations; and being the world's largest consumer of raw and finished products, we may be sure that trade activity throughout the world will be speeded up the moment the wheels of American industry start to move with increasing acceleration.

Foreign countries are in far better shape than they were in 1921. The banks of the Untied States are in a fortified position. Although the volume of their credit outstanding, in the shape of loans and investments, is the second largest on record, they are carrying highly satisfactory excess reserves.

Past experience has shown that the breaking point is usually reached when the borrowings on securities approximate 10% of the market value of the listed stocks. That was the situation in 1920, in 1926 and in October of last year. At the present moment the borrowings are down to 5.40% of market values, the lowest percentage reached since this computation was first reported. This means that Wall Street has rapidly put its house in order.

We are surrounded by problems to be solved and work to be done. But let us not make the common mistake of fixing our attention upon some outstanding difficulty and then refusing to believe that any improvement can set in until this particular menace is removed.

The truth is we never solve all of our problems. Many of the old ones seem to be permanently with us, and dozens of new ones are continually rising to prevent our days from becoming monotonous.

The gold that we are selling today to foreign countries brings us 19% more goods than it did when the Young Plan was put into effect. This means that the American dollar will be increasing in value very soon. It also means that the reparations and war-debt payments will once again be under heavy fire. Fortunately, the new World Bank has been created to take care of just such problems; and while a remedy is being sought, the United States will continue in the most advantageous position.

The electrification of American railroads will soon be going forward on a scale unprecedented. The work now scheduled in the East by the Pennsylvania, the Delaware, Lackawanna and Western, the New York Central, the Lehigh Valley, the Reading, and the Baltimore and Ohio will entail expenditures amounting to hundreds of millions of dollars.

We also face the necessity of constructing huge networks of pipe lines to carry liquid and gaseous fuels from the sources of supply to distant industrial regions. Then there is the certainty of an early resumption of healthy growth in aeronautics, radio, chemistry, motor transport, communication and refrigeration. Plans are under way to make the merchandising of frozen foods a billion dollar industry.

The one development known as quick-freezing means that the railroads must build new types of refrigerator cars, and the automobile industry must supply trucks equipped with refrigeration. Arrangements will have to be made to carry refrigeration through the air in planes and dirigibles, and the companies producing cork for insulation, plate glass, metals, waxed papers and containers of various kinds will have to prepare to take care of the needs of a new and growing market.

I doubt if any of our new industries has a greater future than that engaged in producing plastic materials. Here is a novel business already turning out products valued at one-ninth that of the products from both the lumber and woodworking industries of America. It represents a business that has doubled each year and that has now reached a total of more than one-quarter of a billion dollars annually.

Soon we will have forgotten the panic of 1929 and the year of painful business readjustment that followed. The attention of our 45,000,000 working people will be occupied with ways and means of cutting costs, expanding markets, creating new industries, automatizing processes and devising methods of financial and industrial control that will lessen the likelihood of inflation and reduce the evils and miseries of the business cycle.

We have a rich country and a vigorous people. By earnestly and steadfastly adhering to our present policy of encouraging mechanical developments and supporting scientific research, we will find before long that the rest of the world has cast aside ultra-conservatism and adopted the American plan of machine production. This will mean higher wages and higher standards of living for people everywhere, and the outcome will be increased purchasing power, larger foreign markets and a more even distribution of goods and labor. A more prosperous Europe and Asia would make us a happier people with fewer serious problems to face.

There is a Victor Torch or Regulator for every welding or cutting operation and for all suitable fuel gases.

VICTOR WELDING EQUIPMENT CO.

844 Folsom Street **San Francisco**

EDITORIAL

Favor Won on Merit

SUCH an institution as the National Metal Congress and Exposition could not win the respect and attention of executives throughout the metal working industries in greater proportion from year to year without definitely proving itself to be thoroughly worth while. To hundreds of industrial firms, participation in this week of intensive study of modern metal making and fabrication means simply giving a short leave of absence to a few employes, with the hope that they will return with ideas worth the value of their time. Altogether this represents a mighty high valuation placed upon ideas. To other firms there is credited an investment of many thousands of dollars in the costly displays and demonstrations of equipment and materials, reflecting the faith of merchandisers in the value of the concentrated interest of those who are looking for more knowledge. Another group has spent additional fortunes in research laboratories, in search of fundamental data which will solve production problems, and is literally giving away a generous portion of the results. The metal working industries of America make this huge investment in the "give and take" program of National Metal Week with full confidence that the investment will be profitable, for this event is not an experiment. The number of responsible executives who attend is increasing because each year those who attend for the first time make every effort to set this week aside as one of the most important events of future years. Any plant executive who wonders whether it is worth his while to go this year may well reflect that "fifty thousand American executives can't be wrong."

Still Pioneering

WHATEVER may be the special viewpoint of the individual who is interested in welding, he must keep an open mind in order to have any chance at all of keeping up to date. The assumption that one knows all about the subject is a dangerous one. The uses for the welding processes and the methods of using them are changing, not always in a fundamental way, but at least in important ways. During the past year the steel mills have had as one of their important markets a group of plants who have been making pipe by rolling plate to shape and welding it. In a sense this is a new industry, since the fabrication of pipe by modern processes is said to have opened up new markets for large diameter pipe. Similar progress has been made in methods of fabricating tubing of smaller sizes. The success of the welded tubular structure in aircraft construction has at last attracted the attention of makers of other products in which a tubular assembly offers the possibility of lower manufacturing cost, decreased weight, and greater serviceability, without loss of strength. Research has demonstrated that properly welded tubing is structurally strong enough for many purposes. It is to be expected that the variety of methods of making such tubing will increase. There are possibilities for tubing with reinforcing ribs for greater strength, tubing of odd shapes for ornamental work, and tubing of corrosion resisting alloys for products exposed to corrosion. Certainly pipe welding, aircraft welding, and tube welding are here to stay and have been developed to a high point of satisfaction, but these few hints are enough to suggest that the research worker has not completed his task in these fields. In the railroad field success has been attained in the welding of tank cars, locomotive tenders, parts of boilers and other important units, but welding has much farther to go before the possibilities are exhausted. For example, it is proposed to weld rails of standard length into long, continuous rails without joints in order to eliminate the expense of reclaiming battered joints. In the machinery field the trend is pictured by a large steel company advertising its structural shapes to builders of machines. The battledeck floor is gaining popularity at an astonishing rate and is mentioned in connection with a great variety of building operations. The steel highway, which may have appeared visionary a year ago, is under construction during the present month. These are some of of the more important places where the use of welding is just getting a good start, where markets for things used in welding will grow, and where new procedures and new equipment and new materials will be developed before the pioneering work is completed. By that time the pioneers will have located some more territory for the exercise of their talents.

Value of Practical Knowledge in Weld Design

THE emphasis which has been laid on the subject of design for welded structures is not all misplaced. Men who have been designing heavy steel structures and heavy machinery and who are now being asked to design similar things with a view to having them fabricated by welding will find themselves in need of all of the fundamental information regarding the welding processes which they can get. They will also find it extremely helpful to secure the advice and cooperation of those who are familiar with the practical aspects of welding. The structural steel fabricator, for example, may easily gain valuable knowledge and counsel from one who is experienced in the use of welding on tanks and boilers. The latter can tell the designer a good deal about such an ordinary matter as the tendency of molten metal to contract when it cools to a solid condition. These men who have worked on boilers and tanks know that when rigid joints are welded unseen forces are exerting a terrific pull on the weld metal and the metal adjacent to it. It is possible to make costly blunders in designing welded steel structures if this one item of expansion and contraction is overlooked. The experienced welder on plate work is also apt to be well informed as to how much welding is necessary if it is desired to develop in the weld the full strength of the materials joined. Any welding done in addition to this amount is likewise a blunder from the standpoint of economy. Distribution of the welding may have as much effect on the strength of the completed job and on the economy of the job as the amount of welding. These are some of the important phases of designing for welded construction. The advances which are being made in this field are very encouraging, and as more skillful engineering talent is devoted to the study of weld design the industry will come nearer to the possession of suitable standards of design which will fulfill all requirements of safety and economy. Meanwhile, it is necessary for the designer to increase as much as possible his knowledge of the technical and practical aspects of whatever welding processes are to be used in the assembly of the units which he sketches on his drawing-board.

AUTOMATIC SHAPE CUTTING MACHINES

FOR FABRICATION AND MASS PRODUCTION

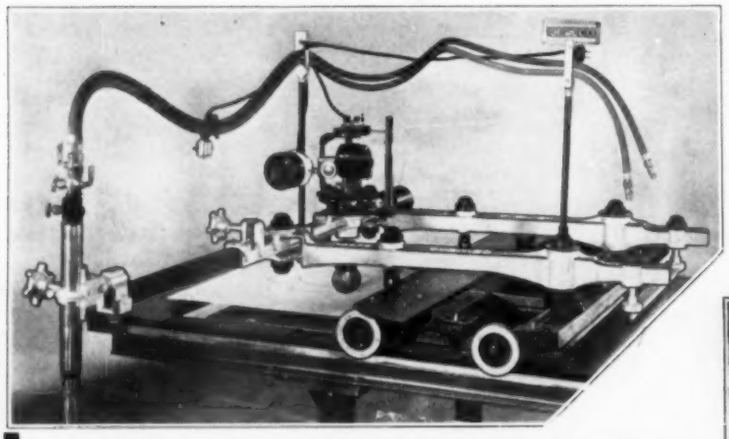
GENERAL WELDING & EQUIPMENT CO. - 70 LANSDOWNE ST., - BOSTON, MASS.

"GWECO" DESIGNED CUTTING MACHINES ARE USED IN THE PLANTS OF THE MOST PROMINENT CONCERNS ALL OVER THE WORLD. THEY WORK IN THE UNITED STATES, CANADA, GERMANY, FRANCE, BELGIUM, SWITZERLAND, AUSTRIA, HUNGARY, RUSSIA, AS WELL AS IN JAPAN AND AUSTRALIA. THEY OPERATE IN THE LARGEST ELECTRICAL AND MACHINERY FACTORIES AS WELL AS IN THE WORLD'S FOREMOST STEEL MILLS AND SHIPYARDS, IN CHEMICAL PLANTS, RAILROAD SHOPS, ARSENALS, ETC. THEY ARE A CLASS BY THEMSELVES AND THEIR REPUTATION IS AS UNIVERSAL AS IT IS UNIQUE.

WITH THE RAPIDLY EXPANDING "FABRICATION" OR CUTTING OUT STEEL ELEMENTS TO BE USED EITHER DIRECTLY OR STRUCTURED TOGETHER BY WELDING, A NEW ERA OF BETTER, QUICKER, CHEAPER AND MORE FLEXIBLE MANUFACTURING OF MACHINERY HAS BEEN INAUGURATED. MANY CONCERNS ARE ALREADY FULLY EQUIPPED, OTHERS ARE JUST USING THE SLACK TIMES TO BE IN LINE FOR THE NEXT STEP UP. BUT A GREAT MANY ARE STILL WATCHFULLY WAITING.

FABRICATION NOT ONLY REDUCES THE ACTUAL COST OF MANUFACTURE, BUT IT SHORT CUTS THROUGH MANY OTHER, SO TO SAY, UNPRODUCTIVE DEPARTMENTS, SIMPLIFYING PURCHASING, STOCK KEEPING, STORING, DESIGNING, MAINTAINING AND STORING OF PATTERNS, ETC., ETC., BECAUSE THE RAW MATERIAL CONSISTS OF STEEL PLATES AND NOT CASTINGS. THESE INDIRECT ADVANTAGES OBVIOUSLY OVERSHADOW BY FAR THOSE OF THE ACTUAL MANUFACTURING. IN OTHER WORDS FABRICATION RELEASES CAPITAL, FLOOR SPACE, GENERAL FACTORY EXPENSES OR IT ENABLES VITALLY INCREASED PRODUCTION WITHOUT ENLARGING EXISTING FACILITIES.

FABRICATION HAS MADE HISTORY IN ELECTRIC FACTORIES AND IT HAS EXPANDED IN STEEL MILLS WHICH ALREADY FURNISH CUT AND WELDED SHAPES BESIDES ROLLED ONES AND EVEN HAVE ADDED THE SALE OF WHOLE FABRICATED MACHINE STRUCTURES TO THEIR REGULAR STEEL BUSINESS. IT ALSO FITS PERFECTLY INTO FOUNDRIES AND THE COMBINATION OF CASTINGS AND FABRICATED MACHINERY PARTS IS ONLY A LOGICAL STEP IN A LOGICAL DIRECTION. AND THERE ARE OTHER GROUPS WHERE FABRICATION MAY SPELL PROSPERITY, **AS SOON AS THAT YOUNG LADY IS BACK ON THE JOB.**



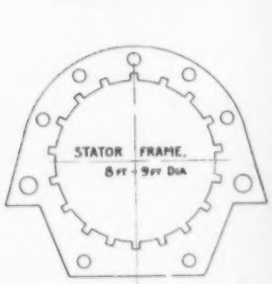
AT LEFT: K-2 "K" KUTTER.

OUR NEW TYPE "K" KUTTERS:
RECTANGULAR CUTTING RANGE:—

SIZE K-1:	2	FT. WIDE,	4	FT.	LONG
" K-2:	3	"	"	6	"	"
" K-3:	4½	"	"	12	"	"
" K-10:	9	"	"	21	"	"

EVERY SIZE IN OPERATION.
LET US SOLVE YOUR PROBLEMS.

AT RIGHT: A WHOLE FAMILY OF "GEWECO" CUTTING MACHINES, AMONG THEM THE WORLD'S LARGEST, CUTTING SIMPLE FRAMES, OR INTRICATE ONES AS SKETCHED BELOW:



2 Cutting Machines
TEMPLATE
8 FT. DIA.
"Geweco" Automatic Shape Cutting Machine Size "K-10"
Rectangular cutting range 9 FT. x 21 FT.

National Metal Week Has Much to Offer

Series of Technical Sessions, Exhibits, and Inspection Trips Arranged So Visitors Can Profit From Full Program Without Inconvenience

NOW that practically all of the final arrangements have been made for the National Metal Congress and Exposition it is obvious that for men interested in welding, Chicago is the place to spend the week of September 22nd. If all the attractions of the week were listed in a single group the reader might get the idea that it would be like attending a three ring circus to try to get the most out of such a complete program; however, the several technical associations who have cooperated in the work of this national affair have been careful to arrange schedules so that there is practically no conflict in interest. The technical sessions, the exposition hours, the inspection trips and the entertainment events have been so arranged that the visitor will easily be able to get the benefit of everything of interest.

C. A. McCUNE
Chairman, Convention Committee
A.W.S.

E. A. DOYLE
President, American Welding Society

C. B. EVANS
Chairman, Chicago Section
A.W.S.

The National Metal Exposition which is to be held at the Stevens Hotel will appeal strongly to those who like to see action. The exhibits will include demonstrations of new equipment and new methods of procedure. Working exhibits have been planned as follows:

The Air Reduction Sales Company in booth No. 95 will demonstrate the use of mechanically operated oxy-acetylene cutting torches.

The American Brass Company in booth No. 92 will demonstrate the use of Tobin Bronze and other copper alloy welding rods and the correct procedure for using copper alloy rods.

The Bastian-Blessing Company in booth No. 96 will have a complete outfit in operation on a production job, furnishing a demonstration of torches, regulators and gas economizers.

The Fusion Welding Corporation in space No. 106 will demonstrate new welding rods and new procedures developed for using them during the past year.

The Lincoln Electric Company in booth No. 90 will have a carbon arc automatic welding outfit operating on pipe, demonstrating the welding of various types of joints.

Units of the Union Carbide and Carbon Corporation will occupy spaces No. 81 and 82 displaying the products of the Union Carbide Sales Company, The Prest-O-Lite Company, Oxweld Acetylene Company, Haynes Stellite Company and the Oxweld Railroad Service Company. A feature of this exhibit will be a guessing contest on the tensile strength of oxy-acetylene welded test coupons which will be pulled on the Oxweld Portable Tensile Testing Machine.

The Modern Engineering Company in booth No. 107 will provide a working demonstration of their latest type regulator with safety check valve and a demonstration of special machine cutting tools.

The Northwest Manufacturing Company in booth No. 3 will have a 300 ampere motor driven electric welder in operation, demonstrating the making of various types of welds. Demonstrations will also be given of the Hansen arc torch used for brazing and for work on non-ferrous metals.

The Taylor-Winfield Corporation in booth No. 94 will have both spot welding and butt welding machines in operation, showing some new features which are being exhibited for the first time at this convention.

The Thompson-Gibb Company in booth No. 97 will exhibit five machines ranging from a bench welder to a heavy duty rim butt welder.

The Westinghouse Electric and Manufacturing Company in booth No. 76 will have in operation portable arc welding equipment and special demonstrations of new welding electrodes.

In addition to these working exhibits which show many interesting types of welding operations there are a number of

exhibits which will principally be displays of complete lines of equipment and supplies as follows:

The American Steel and Wire Company in booth No. 71 displaying a line of welding rods and wire for both gas and electric welding.

Elkon, Inc., in booth No. 98 showing spot welding electrodes and welding dies faced with Elkonite with exhibits showing recent developments in resistance welding.

The General Electric Company in booth No. 80 are preparing an exhibit of several new features in the General Electric line of arc welding equipment.

The K-G Welding and Cutting Company in booth No. 104 will exhibit their latest type of oxygen regulator and a new combination welding and cutting torch. A complete line of oxy-acetylene welding equipment will also be displayed.

samples of a number of interesting applications of these materials.

The Una Welding and Bonding Company, Cleveland, Ohio, in booth No. 105 will show arc welding equipment and welding wire.

The Wickwire Spencer Steel Company will have a model furnace in operation and will exhibit welding wire for gas and electric welding.

The Alexander Milburn Company exhibit will be located in the gas section and will include a showing of equipment for cutting with city gas, natural gas and coke oven gas.

The Southwark Welding Company in booth No. 41-B will have on display the Oxweld type portable tensile testing machine.

This description of the exhibits is necessarily brief, because

Program of the American Welding Society Meeting, September 22-26, Congress Hotel, Chicago, Ill.

IMPORTANT NOTICE

Members and guests are requested to register, as admission to Exposition and some of social events will be by badge only.

ALL Technical Sessions and Committee Meetings will be held at the CONGRESS HOTEL.

ALL sesions start promptly as scheduled.

MONDAY, SEPTEMBER 22ND

Morning

10.00 a.m. Registration (Florentine Foyer)

Facilities will be provided throughout the week from 9:00 a.m. to 5:00 p.m., commencing Monday, September 22nd, at 10:00 a.m.

Afternoon

2.00 p.m. Meeting Structural Steel Welding Committee (Room 1164)

Presiding Officer—To be announced.

3.45 p.m. Meeting American Bureau of Welding (Room 1164)

Presiding Officer—C. A. Adams, director, A.B. W.

Evening

6.00 p.m. Dinner Meeting, Board of Directors (Suite 1102-6)

Presiding Officer—E. A. Doyle, president, A. W. S.

TUESDAY, SEPTEMBER 23RD

Morning

10.00 a.m. Business Session (Florentine Room adjoining Registration Foyer)

Presiding Officer—E. A. Doyle, president, A. W. S.

This will be in the nature of a few introductory remarks by President Doyle; address of welcome by Richard M. Wolf, Commissioner of Public Works, City of Chicago; and transaction of formal business.

Response by C. A. McCune, general chairman, 1930 Fall Meeting and Exposition.

10.30 a.m.—Technical Session (Florentine Room adjoining Registration Foyer)

Presiding Officer—J. J. Crowe, member of Executive Committee, A. W. S.

Welding of Stainless Steel, by L. W. Hostettler, Allegheny Steel Company.

Arc Welding of Aluminum, by W. M. Dunlap, Aluminum Company of America.

Oxy-Acetylene Welding of Corrosion Resisting Steels, by W. B. Miller, Union Carbide and Carbon Research Laboratories.

Afternoon

2.00 p.m. Technical Session (Florentine Room adjoining Registration Foyer)

Presiding Officer—F. T. Llewellyn, past president, A. W. S.

The Examination of Welds by the X-Ray Diffraction Method, by J. T. Norton, Massachusetts Institute of Technology.

Fatigue Investigations of Welded Joints, by G. E. Thornton, State College of Washington.

Stress Distribution in Side-Welded Joints, by Walter H. Weiskopf and Milton Male. A mathematical study in connection with tests made at the University of Pittsburgh.

WEDNESDAY, SEPTEMBER 24TH

Morning

10.00 a.m. Technical Session (Florentine Room adjoining Registration Foyer)

Presiding Officer—E. A. Doyle, president, A. W. S.

Resistance Welding of Bar Joists, by Frank Burton, Steel Joist Institute.

Cost of Using Welding, by Robert E. Kinkead, consulting engineer.

Strength of Welded Joints in Tubular Members for Aircraft, by H. L. Whittemore, U. S. Bureau of Standards.

Afternoon

2.00 p.m. Technical Session (Florentine Room adjoining Registration Foyer)

Presiding Officer—H. L. Whittemore, member, Committee on Standard Tests for Welds.

SYMPOSIUM ON TESTING OF WELDS

1. Introduction and Suggested Revision of ABW Bulletin No. 1, by ABW Committee on Standard Tests for Welds.
2. Tensile Tests for Welds—J. W. Owens.
3. Bend Tests for Welds—W. B. Miller.
4. Shear Tests for Welds—Andrew Vogel.
5. Fatigue and Impact Tests for Welds—C. H. Jennings.
6. Use of Gamma Rays for Examining Welds—R. F. Mehl, G. E. Doan and C. S. Barrett.

THURSDAY, SEPTEMBER 25TH

Morning

9.30 a.m. Trip to Hawthorne Works, Western Electric Company

Afternoon

2.00 p.m. Technical Session (Florentine Room adjoining Registration Foyer)

Presiding Officer—F. P. McKibben, vice-president, A. W. S.

Application of Fusion Welding to Pressure Vessels, by J. C. Hodge, Babcock & Wilcox Company.

Physical Properties of Electrically Welded Tubing, by J. S. Adelson, E. O. Sequist and H. L. Whittemore. The paper will be presented by Mr. Adelson.

Magnetic Testing of Butt Welds, by T. R. Watts, Westinghouse Electric & Manufacturing Company.

Evening

6.30 p.m. Annual Banquet followed by Dancing—Gold Ball Room.

FRIDAY, SEPTEMBER 26TH

Morning

10.00 a.m. Technical Session (Florentine Room adjoining Registration Foyer)

Presiding Officer—E. Wanamaker, past chairman, Chicago Section.

RAILROAD SESSION

Double Lengthening Railroad Rails, by L. C. Ryan, manager, Track Dept., Oxweld Railroad Service Company.

The Possibilities of the Further Development of Railroad Welding, by G. W. Lieber, Supt. of Reclamation, Missouri, Kansas & Texas Railroad Company.

Reclamation of Battered and Worn Ends of Railroad Track, by C. J. Bergunthal, Track Welding Supervisor, Southern Pacific Company.

Elimination of Joint in Open Track, by J. H. Deppeler, Chief Engineer, Metal & Thermit Corporation.

The Metal and Thermit Corporation in booth No. 101 will display one large cast iron weld, five welds on heavy steel sections, one weld on 1½-in. double extra heavy pipe and one weld on 2-in. extra heavy pipe.

The Page Steel and Wire Company in booth No. 78 will show welding wire for both gas and electric welding.

John A. Roebling's Sons Company in space No. 102 have prepared two model shops in miniature, one of which shows a boiler shop in operation. Gas and electric welding wire will be displayed.

The Stoody Company, Whittier, California, in booth No. 103 will have on display a large collection of photographs illustrating the use of special welding materials, and actual

there are so many firms exhibiting things of interest to welders that space does not permit giving complete details. One who has attended the National Metal Exposition in previous years will recall how the crowding of the welding section indicated the intensely interesting character of the exhibits. However, this does not represent everything that there is to be seen. There are many other exhibitors displaying a great variety of metal equipment and every year there is a noticeable increase in the amount of this equipment which is assembled by welding. There are also a number of booth occupied by manufacturers of special steels and non-ferrous alloys. For the most part, there will be found in attendance at these booths metallurgical engineers who have worked on the prob-

lems involved in welding these materials. These men are always glad to talk about the possibilities of welding their products and give to visitors the benefit of their experience with different welding methods and with different procedures.

In addition to what there is to be seen at the Exposition, there are some things to be seen outside. Arrangements have been made to visit the Hawthorne Works of the Western Electric Company at 9:30 A.M. on September 25th. This company manufactures most of the telephone and talking picture equipment used in the United States, and the plant to be visited maintains a force of 30,000 employees. The visitors will be conducted through welding installations which incorporate the use of automatic, semi-automatic and hand arc welding equipment, and at least one spot welding installation. The trip will also include other representative manufacturing departments such as copper wire and rod manufacture, lead covered cable manufacture, and as many assembly and fabricating departments as time will permit. It is also planned to exhibit to the visitors the principal features of sound picture equipment which will be illustrated by means of a talking picture describing deep-sea cable laying. There will be no technical session on the American Welding Society program on Thursday morning, so that those who take advantage of the opportunity to make the inspection trip will not miss any part of the welding program at the Congress Hotel.

In connection with the general program of the National Metal Congress, there is included on Tuesday morning an inspection trip to the plant of the Chicago Steel & Wire Company at 103rd Street and Torrence Avenue, Chicago. This will furnish an opportunity to get a view of some of the details involved in the drawing, processing, coating and preparing of rods and wires for oxy-acetylene and electric arc welding, methods of testing welding wire, etc. Directly following the visit to the Chicago Steel & Wire plant, the inspection party will visit the plant of the Carbo Oxygen Company, which is located next door. There will be seen the processes involved in manufacturing, compressing and shipping oxygen and it is also planned to provide a demonstration of the properties of liquid oxygen.

Those who come to Chicago for the National Metal Congress should be sure to register and secure programs giving the details of all the technical meetings which are being held during the week. The two organizations which are particularly interested in welding are the American Welding Society and the Gas Products Association. The Gas Products Association postponed its Summer meeting in order that the meeting might be arranged at the time of the National Metal Congress. Their programs at this time will be limited to business meetings which will be held at the Congress Hotel.

The complete program of the American Welding Society meeting, which is reproduced on this page, covers quite a range of fundamental subjects which are naturally of interest to men engaged in a great variety of welding operations. The Exposition at the Stevens Hotel will be open on Tuesday evening and Friday evening until ten o'clock; so there is plenty of time for visitors to attend all of the meetings of the American Welding Society and still leave an opportunity to spend plenty of time inspecting the exhibits. The Annual Fall Banquet, which is being held in the Gold Room of the Congress Hotel on Thursday evening, promises to be a thoroughly successful and enjoyable affair, an attendance of about 500 being expected. This is to be a dinner-dance, and it is hoped that as many members and guests as possible will be able to bring their wives so there will be a good sized crowd to enjoy the dancing which will follow immediately after the dinner. A good program of ladies' entertainment has been arranged by the American Society for Steel Treating, including luncheons, sight-seeing, and bridge. There has been no special feature scheduled on the program for Wednesday evening. This allows everyone to have an evening in which to do as he pleases without missing anything.

The entire week has been splendidly planned to provide plenty to see, plenty to hear, and plenty to do, without conflict and without loss of time.

"METAL PROGRESS" FEATURES WELDING IN FIRST ISSUE

The first issue of "Metal Progress," published by the American Society for Steel Treating, appeared under date of September, 1930. The new magazine is 9½ in. by 12½ in. size, and the first issue runs over 200 pages. It is beautifully printed on specially selected stock, and from cover to cover it shows every evidence great care was used in the typography and in the preparation and arrangement of illustrations. The advertising pages have been given the same attention as far as typography is concerned which has been given to the reading pages, resulting in an artistic effect which is seldom found in technical publications. Members of the A. S. S. T. have reason to be proud of the production of "Metal Progress." In the first issue there are several feature articles in which welding plays an important part. One of these is a description of the use of electric resistance welding by Steel and Tubes, Inc., Cleveland, Ohio, in the production of steel tubing. Another describes the new equipment recently developed by the General Electric Company for electric resistance brazing. Another is a discussion of the present status of the regulations concerning the application of fusion welding to boiler drums.

DETROIT ORDERS MORE WELDED PIPE FOR WATER MAINS

The Department of Water Supply, City of Detroit, has just awarded another large contract for electric welded pipe. They were among the first municipal departments of the world to take advantage of the large carrying capacity of welded pipe coincidentally with the consideration of more durable material for the important pipe lines on the basis of estimated service life.

The latest contract, the third and largest that they have ever awarded for electric welded Armco Ingot Iron pipe, calls for 2,100 tons, or 13,700 ft.

The contract for furnishing and laying this pipe line was awarded to A. Phelps & Son, Detroit, Mich. The pipe will be fabricated by the United Welding Company, Middletown, Ohio. The design, which calls for ½-in. Armco Ingot Iron plates 122x173¼ in. and 122x212 in., has been formally approved by the Department of Water Supply.

An unusual design, unique in welded pipe construction, will be employed by the fabricators of this line. The pipe will be delivered in 40-ft. lengths for the 54-in. and 30-ft. lengths for the 66-in. The 40-ft. lengths, which are 33⅓% longer than the standard, will be made of four plates. In 7,000 ft. of 54-in. pipe, this increase of 10 ft. per section will result in a large reduction of field joints with accompanying economy in field work.

Although welded construction, the pipe will be formed like the old-fashioned riveted page. Plates of pure iron, ½ in. thick and 122 in. wide, either 173¼ or 212 in. long, will be rolled so that one plate will go entirely round, forming a complete ring of pipe. Four of these rings (in the case of the 40-ft. section) will be lap-welded in the shop, making a 40-ft. section. This design was first used in the installation of 9,300 ft. of this pipe last May at Detroit and again in November when 9,000 ft. was laid.

The circular seams, lapped approximately 1½ in., will be welded inside and out, while the longitudinal seams will be

butt-welded. In and out courses will be used throughout each section of the pipe.

The sections will be carefully tested for tightness and the surface thoroughly cleaned and dipped in protective coating before shipment.

This combination of the old design and its new application gives a pipe that is unusually stiff, because of the lap-welded circular joints. This makes it possible to place the pipe under deep fills without angle reinforcing rings. Another inherent advantage is the fact that plate metal pipe is not subject to sudden breaks which cause serious interruption to service and great damage to streets and adjacent property.

The order, which totals over $432,000, calls for 7,100 ft. of 54-in. pipe and 5,600 ft. of 56-in. pipe, or a total of 12,700 ft. This brings the order to a total of 2,100 tons.

NEW BRICK PAVEMENT HAS IRON BASE

An experimental pavement, 150 ft. long, employing an iron base and curb, with a layer of brick for the surface, is being constructed near Springfield, Ill., on the Grand Avenue connection with the Rochester Road. Three different designs will be used, and comparative tests made. The iron base and curb will be laid on a levelled highway, says a report which discusses the design, and it may result in revolutionizing the building of roadways.

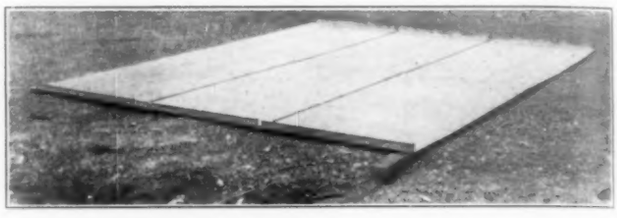
As explained by the engineers, the road will have a carefully rolled and prepared sub-grade, on which the iron base and curb will be laid. Next will follow a mastic sand cushion, upon which will be placed a layer of 2½- or 3-in. brick with asphaltic filler poured into the interstices between the bricks. The result, it is declared, will be an indestructible base, with a smooth riding surface built into the structure with sufficient flexibility to meet all changes in temperature without breaks or cracks.

The iron base will consist of three 50-ft. sections. One will be blue annealed flat sheets and the other two galvanized corrugated sheets. The corrugations in one 50-ft. section will be parallel to the road and in the other they will be transverse. The flat iron base will be ¼ in. thick, and the corrugated galvanized base will be of 10-gage iron.

The blue-annealed section is so designed that two sheets laid end to end will span the highway. Expansion and contraction in this section will be provided for along the center line, where the end of one sheet will be laid on the edge of the adjoining sheet, to provide free movement. One transverse edge will be turned down to grip the roadway, whereas the other edge lying transverse to the road will be supported upon the adjoining plate section, thus providing free movement for contraction and expansion. The end of the plate section at the edge of the highway pavement will be turned up to form a retaining wall for the brick or other paving material. Turning up the edges of the sheet also gives rigidity. Rigidity is also obtained by the corrugations used in the other two 50-ft. sections.

In the section where the corrugations of the galvanized sheets run parallel to the highway, the outer sheet edges will be turned up to retain the paving material. One edge of each of the other sheets will be turned down to grip the roadway, while the other edge will be lapped one corrugation on the adjoining sheet. A T-bar will be used under each transverse joint.

Where the corrugations run transversely, difficulty is experienced in bending the sheets against the corrugation to form the curb. Hence L's will be welded along the outer edge of the sheets to retain the brick or other paving material, each L being 16 ft. 8 in. long. The ends of the sheets lying on the center line of the highway will be laid on a T-bar. One transverse edge of each sheet will be turned down to grip the roadway, while the other edge will lap onto the adjoining section, as explained above.



Section of Sheet-Metal Road Base With Flanged Edges.

These three types of experimental sections will be tested under actual traffic conditions. If they prove successful, great progress will have been made in highway construction, is the belief of engineers. Such a roadway will not only be flexible, but should eliminate cracking and permanent deformation. The use of rust-resisting materials will insure durability. The iron base is Armco Ingot Iron, and will be rolled and fabricated by The American Rolling Mill Co., and the brick will be furnished by the Poston-Springfield Brick Co., of Springfield, Ill. The National Paving Brick Manufacturers' Association is co-operating in the test. Mr. Mosely, the originator of the idea, specified rust-resisting iron, because he recognized that the success of the new metal highway depended to a large extent on the longevity of the metal used.

Views of Welded Pile-Driver Lead, Showing General Construction and Details of Curved Section.

ARC WELDING USED IN CONSTRUCTION OF PILE-DRIVER LEAD

A job recently completed by the Paxton & Vierling Iron Works, of Omaha, Neb., manufacturers of structural steel and ornamental iron and steel, was the construction of a pile-driver lead for one of the large railroad companies. The curved sections shown in the illustrations were 6x4 in. angles. The procedure consisted of cutting out a large section of the 6-in. leg, then making the bend, and finally welding back a piece of plate into the gap. Commenting on this construction, F. H. Marsh, sales manager of the Paxton & Vierling Iron Works, says, "It would have been most interesting to many opponents of welding to have seen our men sledging these welds with a 12-lb. sledge without cracking any portion of any weld."

Modern Arc-Welding Practice*

Applications of Arc Welding Are Increasing, With a Better Understanding of Weld Design and of the Many Advantages of Welded Construction

By J. M. Hipple† and G. D. Fish‡

THE attention of engineers, interested in the construction of machinery, bridges and steel buildings, is becoming focused on the great economic advantages to be gained by employing arc welded structures in their design.

The art of arc welding is not new but its recent widespread application, within the past few years, in all of these fields, the resultant economies and its successful service record insure to it a permanent place as an approved engineering practice.

The commercial application of arc welding in many types of small structures and machines is very old and the reason for its coming into general use only now, that is, within the last several years, on large machinery and in buildings, appears to be due to the comparatively recent research work that has been done on the strength and reliability of welds and the complete practical success of pioneer structures, both of machines and buildings, that now have several years' service record.

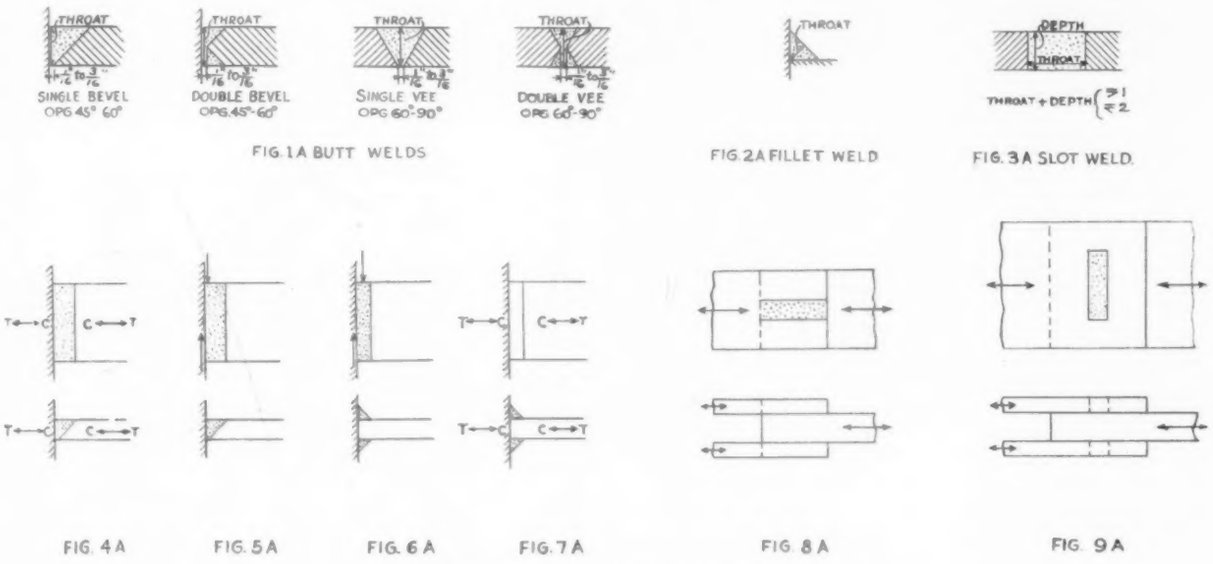


Fig. 1. Weld Forms and Various Cases of Loading.

Arc Welded Connections for Buildings and Bridges

Among the more noteworthy American welded structures may be mentioned:

Sharon, Pa., 1926. 6 story factory, Westinghouse Electric and Manufacturing Company. 790 tons steel, with 22 heavy plate girders. The first large welded building.
Chicopee Falls, Mass., 1927. 135 foot span through-truss railway bridge, Westinghouse Electric and Manufacturing Company. The first welded bridge.
New Haven, Conn., 1928. Yale University Library Book Tower, 135 feet high, with 50,000 welded joints.
Hot Springs, Va., 1928. 11 story building, Homestead Hotel.
Glendale, Cal., 1929. Forest Lawn Mausoleum, containing welded truss 95 feet long, with 1,000,000 pounds chord stress, weighing 35 tons.
Los Angeles, Cal., 1929. Southern California Edison Company office building containing 3,000 tons of steel, 75 per cent welded; 12 stories.

Chief among the advantages of arc welded joints over riveted ones are cost saving, rigidity and absence of construction noise. Cost savings result from reduction in weight of steel and labor saving in fabrication and field work. Rigidity is inherent in welded connections and tends toward long life of the construction. Silence of erection by the welding method is largely responsible for its popularity with the public at large.

The dependability and economy of welded construction are well known to those who specialize in this work and are becoming more widely appreciated from year to year. Procedure control for insuring the soundness of welds is the same for construction of buildings and bridges as for machine building, ship construction and various industrial applications; it is not the purpose of this article to show how the dependability of welding is insured. The question of economy, on the other hand, is not the same as in other applications of welding; it will be discussed very briefly.

Steel building frames consisting of beams and columns afford opportunities for moderate savings in weight of steel, such as reduction in connection material, reduction in size of beams due to continuity, superior efficiency of welded joints for wind bracing; the range of savings for this class of structure, in terms of weight of steel, is generally from 3% to 13%. Other economies of welding for such buildings are effected by eliminating a large proportion of the fabrication required for riveted construction. There is further labor saving, both in shop and in field, due to the fact that less labor is needed for performing a given amount of welding than for driving rivets equivalent in strength to that of welding.

Trusses, whether for buildings or for bridges, require far less steel and far less fabrication if welded than if riveted. Light trusses, as used for roofs, do not require gusset plates, the web members being lapped on the chords

*Abstracted from a paper presented before International Congress of Steel Construction, Liege, Belgium, August 30 to September 7, 1930.

†Works Manager, East Pittsburgh Works, Westinghouse Electric & Mfg. Co.
‡Consulting Structural Engineer, Westinghouse Electric & Mfg. Co.

and welded directly to them. Heavy trusses are connected with gusset plates which are slot welded to the members; the relatively high strength concentration, provided by slot welds, makes it possible to use gussets of far smaller area than required for riveting. In all welded trusses, light and heavy, the avoidance of rivet holes affords a saving in cross section of tension members. It is common to save 20% to 25% weight due to welding instead of riveting trusses.

Weld Design

A basis of design for welds in buildings has been established, insofar as working stresses are concerned, by the American Welding Society in its "Code for Fusion Welding and Gas Cutting in Building Construction, Part A," 1928. These working stresses are substantially in agreement with the practice of American engineers who have specialized in this class of work for several years. This code does not lay down methods of analysis by which to determine the critical stresses in welds, such analysis being left to the judgment of engineers who apply the code. As the distribution of stress in welds, especially fillet welds, is as yet imperfectly understood, any rules of analysis must for the present be somewhat arbitrary. Mr. G. D. Fish has attempted to meet the need for a temporary basis of analysis in his "Specification for Arc Welded Connections in Bridges," which appeared in *Engineering News-Record*, August 22, 1929, which sets forth partly rational, partly empirical methods of stress determination which are as applicable to buildings as to bridges; this specification prescribes a basis of working stresses applicable to bridges, but not to buildings.

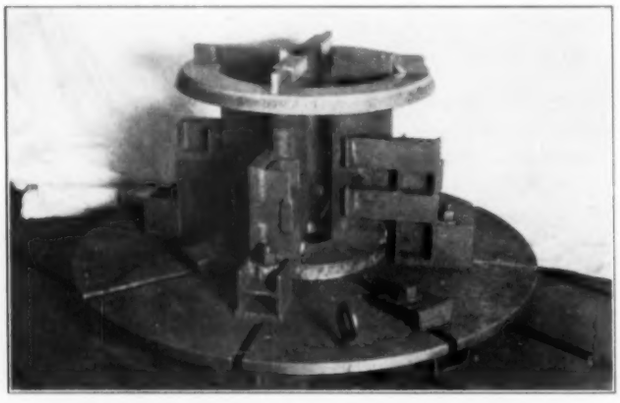


Fig. 2. Jig for Holding Spider During Welding Operation.

Stripped of arguments and explanations, the foregoing mentioned basis of analysis for welds in buildings and bridges is as follows:

DESIGNS OF WELDS

Recognized weld forms: Beveled butt welds, figure 1A; 45° fillet welds, figure 2A; slot welds, figure 3A.

The following cases of loading, and combinations of same, are recognized:

Case 1—Butt weld in direct stress, figure 4A.
Case 2—Butt weld in longitudinal shear, figure 5A.
Case 3—Fillet weld in longitudinal shear, figure 6A.
Case 4—Fillet weld in combined direct stress and transverse shear, figure 7A.
Case 5—Slot weld in longitudinal shear, figure 8A.
Case 6—Slot weld in transverse shear, figure 9A.

Case 1 is designed for tension or compression. Cases 2 to 6 are designed for shear; Case 4 involves complicated stress distribution which is not well understood, but it is on the safe side to consider the total load divided by throat area as unit shear and to design accordingly.

In a combination of Cases 1 and 2, the resultant unit stress is oblique; an approximate treatment, which is considered justifiable, is to design the weld for this resultant unit stress as if it were normal tension or compression on the throat section, or for the unit longitudinal shear, whichever requires the larger sectional area. In a combination of Cases 3 and 4, or of Cases 5 and 6, the weld is designed for the resultant oblique shear on the throat section.

For any combination of bending or twisting moment with any of the cases of concentric loading listed above, allowance is to be made for the increase in unit stress at ends of weld caused by such moment. The unit stress at either end due to a moment may be found by dividing the moment by the following modulus: Throat × Square of length ÷ 6.*

There is an unsettled question as to the propriety of using butt welds in tension, in view of the occurrence of initial stresses when the weld metal cools immediately after deposition. There are grounds for believing that where stress variation is wide and frequent, especially if accompanied by impact, it is unwise to use butt welds for connecting tension members, but that butt welds suitably designed and laid down with proper sequence of beads can safely be used to transmit tension in buildings or other structures where live load is gradually applied and is not very large in comparison with dead load. Experience has not shown any need for restrictions as to kinds of stress transmitted by fillet welds or slot welds.

Allowable Working Stresses

For buildings, working stresses are prescribed as follows, in terms of pounds per square inch of throat section: for shear 11,300; for tension 13,000; for compression 15,000.

For bridges, or other structures in which live load variations are frequent and large, working stresses are based on yield point and endurance limit of weld metal and are prescribed in terms of range of stress and maximum stress as follows: maximum stress plus one-half the extreme range of stress, in pounds per square inch of throat section, shall not exceed 10,000 for shear, or 16,000 for direct stress. In this specification, impact is not allowed for in the unit values 10,000 and 16,000, but must be treated as an addition to the live load.

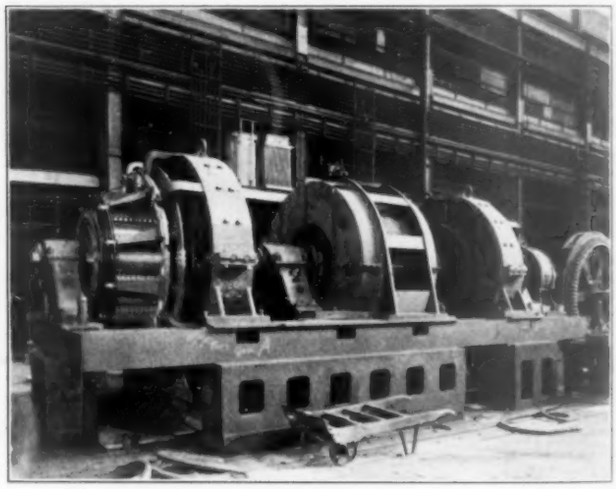


Fig. 3. Welded Steel Base Supporting Three Welded Machines.

This treatment is applicable only to moments acting about transverse axes (that is, axes at right angles to longitudinal axis of prism). It is based on the same assumption that is used for moments resisted by a line of rivets, namely that the relative moment of connected parts and hence the strain in the weld (or rivet) is proportional to distance from neutral axis. In case of a moment of torsion in the throat section of a short and thick butt weld, the above assumption is inaccurate and the maximum torsional shear should be computed as for torsion in a rectangular section of steel. Moments about longitudinal axes of fillet and slot welds should not be allowed to occur. Butt welds may be used to resist bending about longitudinal axes, provided that single bevel and single vee butts shall be reinforced on reverse side as protection against cracking at the root; bending stress is figured by dividing moment by section modulus: Length × Square of Throat ÷ 6.

There are some inconsistencies as between the working stresses for buildings and those for bridges. For instance, if the bridge code be adapted to building design by striking out the allowance for stress variation which accounts for fatigue, the allowable values for maximum stress become 10,000 for shear and 16,000 for tension or compression. In part, the differences between these values and the corresponding figures in the building code are due to the bridge specification being based on yield point and endurance limit and the building code being base on ultimate static resistance. The difference between 16,000 and 13,000 in the allowances for tension (pertaining to butt welds) is due largely to the following: the bridge specification recognizes more truly than the building code the strength properties of weld metal in tension, but takes account of possible initial tension in butt welds by prohibiting their use for connecting tension members which sustain live loads due to trains or vehicles, whereas the building code permits the use of butt welds for connecting tension members of any class, but penalizes them by an arbitrary reduction in working stress. This difference in treatment seems to the writers quite reasonable in view of the difference in character of service contemplated by the two specifications.

Welding and Riveting Practice Compared

Floor beams in buildings and floor stringers in bridges may sometimes be made continuous with net advantage in cost; saving in freight of beams due to continuity must be estimated against extra welding at connections to develop continuous beam action. In buildings where wind stresses require very stiff connections of beams to columns, continuity may have to be developed regardless of considerations

Fig. 4. Showing Simplicity of Welded Generator-Frame Construction. (Note plate rings, spacing bars, and wrapper plate. The wrapper plate is bolted, then tacked in position for final welding.)

of economy. In bridge floors, continuity of stringers may be advisable for the sake of eliminating angular deflections at supports, which deflections are frequently very damaging to riveted connections.

Plate girders and built-up truss chords may economically be made of plate material without angles, owing to the facility with which plates meeting perpendicularly may be connected by fillet welds. The moment of inertia per square inch of cross section is generally increased by omitting angles, an important advantage in case of heavy girders.

End connections between a beam and supporting members can very economically be made by vertical fillet welds connecting the web of the beam directly to the faces of the supporting members, provided the beam is to be simply supported (not fixed or continuous at the ends). Note, however, that if the supporting members are very stiff or are not free to deflect so as to accommodate the end slope of the beam when deflected by load, then there occur secondary bending stresses at the connections which may crack the welds

Holes for bolts or rivets are not needed, except such few as may be required for erection purposes; it is never necessary to make any deduction for cross section of holes in a tension member or a tension flange, because holes need not occur in a critical section.

Gusset plates and other connection material may be omitted entirely at many joints, and, where needed, may be made smaller than would be required for riveted connections.

Slot welds are most advantageously placed parallel with stress in most cases.

Butt welds, especially thick ones, are usually uneconomical, mainly because they require accurate lengths and beveling the ends of members, but partly because they

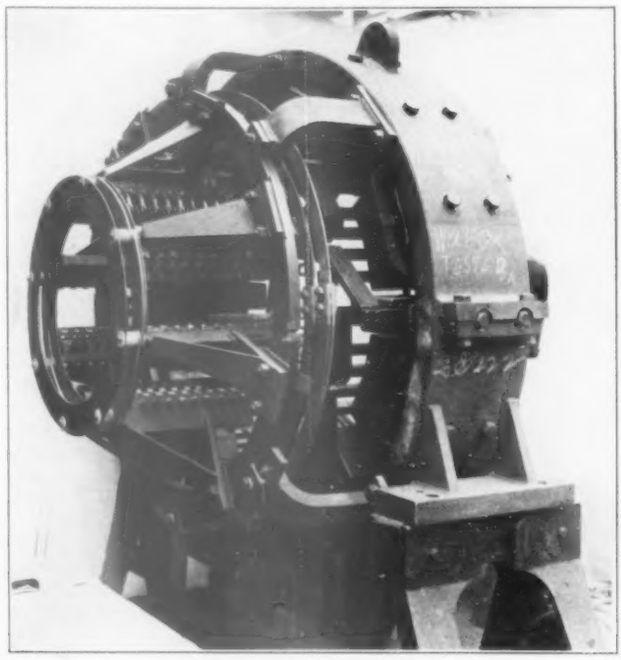


Fig. 5. Typical Direct-Current Stator.

require special technique and involve a large amount of weld metal to support a given load. They are sometimes useful or even indispensable because of their compactness and directness.

Generally, fillet welds cost less than slot welds for equal total strength, but in cases of very large total loads the concentration of strength effected by slot welds is necessary to keep the connections compact and light. The saving in weight of gusset plates or other connecting parts due to slot welds may more than offset the extra cost of the welding.

Fillet welds of small cross sections require less weld metal than thick fillets of equal total strength. Fillets larger than ¾ inch leg dimension are uneconomical because of the large volume per unit of strength. On the other hand, there seems to be no advantage for most purposes in using fillets smaller than ⅛ inch, because the electrode size and current have to be reduced.

Overhead welding is slow and should be avoided if possible. It is frequently unavoidable in reinforcing old bridges.

Welding of Machine Structures

The status of the application of arc welding at this time is well exemplified in the electrical machinery field in this country. Large castings for frames, spiders, bedplates and brackets are rapidly disappearing from the designs, their

place being taken by structures fabricated from roller bars, shapes and plates, electrically welded.

Fabricated and welded structures were initially introduced in this field as a substitute for castings because of the possible weight saving in the finished machine. Such construction had previously been used in much smaller machines where weight was a secondary consideration, but where it was found that the use of a rolled plate electrically welded at the ends and with suitable mounting plates attached could be produced as a frame for a direct current motor at a lower cost than a casting. The problems involved in adapting this construction to large machinery were much more involved, but the advantages to be gained are notable.

Advantages of Fabricated and Welded Structures

The initial advantage gained is in a reduction of time necessary to produce the structure, frame, spider or bedplate. In this class of apparatus, there is comparatively little duplication and the time required to make the pattern for a casting is almost always more than adequate for the production of the complete fabricated structure. In a recent instance, the frame for a 5000 H. P. mill type motor, using non-stock material, was complete ready for machining 30 days after the design was complete, and the complete motor was ready to ship in 88 days. With smaller frames up to sections of 4½ by 32 inches, where the slabs are carried in stock, it is only a matter of from three days to one week to produce the frame.

The reduction of weight is of advantage because of the greater ease of handling in manufacture, in shipping and in erection. One of the indirect advantages in very large machine frames is that it makes it possible to place the windings in frames in the factory before shipment, in cases where the weight of a cast frame would necessitate placing the windings in the frame after shipment to the ultimate place where the machine is to be installed. It is obvious too that with the same weight as where castings are employed, a much stronger structure can be made.

The absolute uniformity of rolled materials removes the hazard of casting flaws and of cracks resulting from shrinkage strains that may or may not be discovered by machining in the factory, and which seriously or possibly disastrously weaken castings.

These flaws or cracks, when discovered during manufacture, sometimes are of such a nature as to result in condemnation of the casting and a serious delay in completion of the machine.

The amount of machining necessary has been reduced as compared with castings, in most cases due to the uniformity of section of the materials used and the reduced amount of material to be removed, and in part due to the ingenuity of the designers in employing all the available rolled sections in such a way as to eliminate operations.

Materials Used

The materials used are plates, bars, rods, pipes and standard structural shapes. There is such a wide range of these materials available that a real production and stocking problem arises, unless certain preferred styles and sizes are established for use of the designers in a given line of manufacture. That this is possible is indicated by the fact that in our own practice, where H beams are extensively used, ranging from 6 inch, 27.5 lb. per foot, to 14 inch, 115 lb. per foot. A complete stock of materials necessary to produce frames, rotors and bedplates for machines up to 120 inches diameter are now carried in stock with an investment of only about 8% of that which would be needed if such parts were made from castings.

The technique of arc welding is well understood and is not properly a part of this discussion, but the shop practice, adopted to secure a high quality of weld, is of great importance and will be outlined briefly. It is required that all welds be specified on the drawings in detail, showing the length and the amount of weld material to be laid down. An engineering process specification outlines in further detail the welding practice to be followed as to cleaning the surfaces to be welded, size of welding electrode wire, wire brushing the deposited layers, amount of peening if any and the inspection procedure.

Training Welders and Checking Their Work

Both for hand and automatic welding, it is essential to develop skilled workers and to develop methods for checking their work. The application of welding is growing so rapidly that anyone making extensive use of it will find it advisable to establish a welding school or training department. Such a department may serve the dual purpose of developing workmen and be a checking point for periodical production and check of test pieces by the welders after they are in production work.

We have found that young men, having had some metal shop experience, can be trained in such a school in from four to six weeks to produce uniformly dependable simple welds. During this period, their welds are given physical tests and are broken apart so that the welder gains a first-hand knowledge of the external and the internal appearance

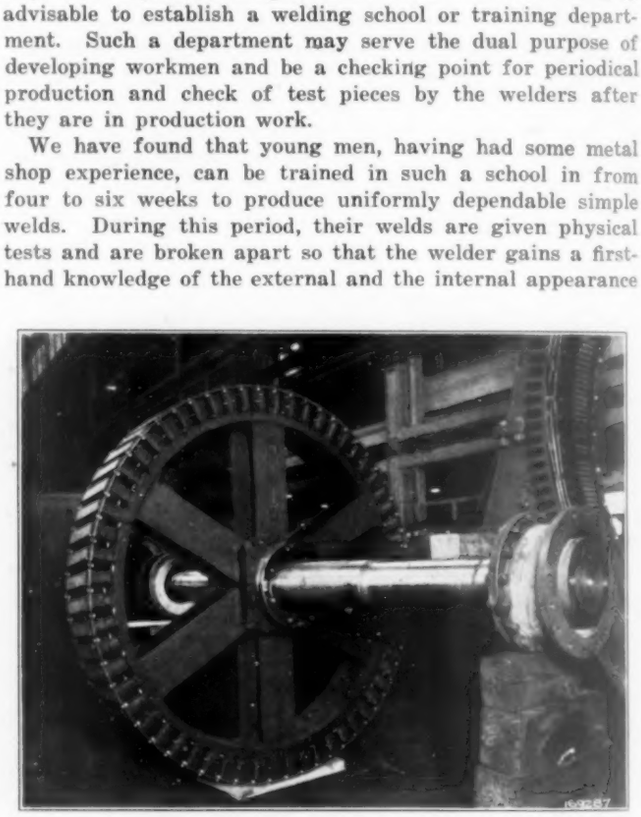


Fig. 6. Rotor for Synchronous Motor.

of good and bad welds. A minimum strength of 40,000 pounds per square inch is required before the welder is placed on production work. After going on production work, the welder is under the supervision of an instructor, in addition to the regular supervision, for a period of two months. After this period, he is able to work independently, although of course acquiring greater skill for a period of a year or more.

For purposes of identification and with a view to encouraging the welder to take a pride in his work, each welder is provided with a steel stencil with which he marks or autographs each weld with his identifying number.

Skilled welders are used as inspectors, checking during the welding process the fusion with a parent metal, the preparation, size and appearance as specified by engineering information.

At intervals, welds made by each operator are chipped out to observe the depth of fusion, amount of slag inclusion and general appearance of work.

Welders are required, at intervals of two months, to produce test pieces which are given physical tests and the welders graded. Any welder, whose test weld falls below

minimum requirements of 40,000 pounds per square inch, is either taken off the work or sent back to the school for further instruction.

With these relatively simple precautions and inspection methods, it is possible to undertake a welding program on any desired scale with complete assurance of satisfactory results. Our own experience during the past several months, when a very large increase in production of welded structures has been handled with a resultant need for a large increase in the number of welding operators, has been that the percentage of poor workmanship has been no higher than that in machining work, and there have been no cases whatever of weld failures after shipment of apparatus from the factory.

Equipment

Since a considerable part of the plates, bars and shapes used must be bent to circular or other shapes for adaptation to machine construction, it has been necessary to equip for such work.

In the case of plates to be rolled for cover plates, the ordinary three-high pyramid roll is used. Where the plates are to be used flat, but of irregular shape, automatic gas burning equipment is used on a large scale, there being a great volume of such shapes required. Edgewise bending of strip material to form end plates is done in an edgewise bending roll. For the rolling of heavy bar sections, it has been necessary to develop special designs of heavy vertical bending rolls.

A 200 ton sectional flanging press, suitable for shaping material of a wide variety in dies, is quite an essential part of the equipment. The assembly of the pieces to be used in a given construction, after they have been rolled or cut to size, can at times be handled to advantage by the use of a jig or fixture that will locate and hold them in their relative positions during the welding operation. A fixture used in spider assembly is shown in Figure 2.

Automatic welding equipment is used not only for long welds, but often for short welds, where the design permits ready handling of the equipment and the work.

Typical Construction

One of the earliest and simplest applications was to the construction of bedplates. For such bases for machines of about 200 H. P. and up to the largest size, all requirements can be met by the use of five H beam sizes. The H beam is placed with the flanges vertical to secure the maximum rigidity, and suitable top plates are welded at desired points to support pedestals or frame feet.

A typical fabricated and welded base, on which are mounted three fabricated and welded machines, is shown in Figure 3. This construction involves the use of simple members of standard section, a minimum of welding and a maximum of strength. The weight saving compared with a casting is about 50%.

Frames for large a. c. generators present a somewhat more involved problem partly because of size and partly because there seldom is duplication which would permit of providing permanent fixtures for holding the structural pieces in position during assembly. These frames, as shown in Figure 4, consist of a series of circular plate rings spaced by bars welded to the inner bore and a wrapper plate welded to the outer periphery. The laminations are supported by the round bars which are welded to the inner cross bars. This construction can obviously be given any desired strength and rigidity by proportioning the number and thickness of the members.

The frames of D. C. machines differ in that a heavy section is needed for magnetic reasons. They are of simple construction consisting simply of a rolled ring, which may be split if desired, with suitable plate feet welded in position. Where the frame is split, bolting lugs are welded in position at the split. A typical machine of moderate size is shown in Figure 5.

In the construction of rotating elements or spiders, the use of a circular, solid or split hub will be found with radiating arms of structural shapes or bars, and in some cases an outside ring to form a complete wheel. In synchronous machine rotors, the outside rim is required as a path for the magnetic flux, the poles, carrying field coils, being bolted directly to the outer surface as shown in Figure 6. While this construction is exceedingly simple and rugged, precautions must be taken in this type of design where the structure may be subjected to pulsating torques, as when connected to Diesel engines, to distribute the stress at the point where the arms are welded to the hub by the introduction of suitable plates, also preferably by normalizing the entire structure by annealing to remove any local internal stress introduced into the arms during welding. Such measures make possible an entirely adequate structure, and a large number of machines over a wide range of sizes up to 120 inch diameter of rotor of this design have been produced with entire success.

While a considerable number of constructions have been described and illustrated, it has not been possible to cover many of the interesting applications. For example, circuit breaker tanks have long been built of rolled plate welded, and now the tops and the bases are fabricated and welded. Frames for switch-gear, for industrial controllers and for induction voltage regulators are other applications.

One of the most interesting developments is the use of fabricated and welded jigs and fixtures from small to large size, displacing castings formerly used, saving the cost and time of producing patterns, avoiding possible loss and delay due to casting defects and reducing the weight.

Types of Welds

It will be observed from the illustrations that these structures have been designed to use fillet welds in nearly all places. Such welds are the most practical as they require less preparation of the parts and are stronger for the amount of weld metal deposited. Where flush welds are necessary and unavoidable, the double-V type is used wherever possible. When it is necessary to use a single-V butt weld, it is usually reinforced at the root.

Special attention is given to problems of designing the structures to allow easy access to the point of application of the weld metal, as well as to the proper welding procedure particularly as it affects the introduction of welding stresses and distortion.

The larger proportion of the fillet welds are of the minimum size used for such sections; that is, ⅜ inch. Larger fillets than this are used only where the length available for the weld metal is not sufficient for strength. It is usually unnecessary to use any fillet welds larger than ¾ inch. However, when this occurs, special attention is given to the welding procedure.

An arbitrary value of 10,000 pounds per square inch stress has been set for use in stationary parts with static loading, and 5,000 pounds per square inch for all rotating parts. These conservative values have been used in view of the fact that such structures are revolutionary in their application, and when the development of the art progresses they can be increased.

General

The earlier and even the present designs reflect to some extent the design engineers' previous work with castings and with riveted structures. As this new art further develops, there is no doubt that greatly improved practice will be adopted, the engineer will think more clearly in

terms of the possibilities of fabricated and welded structures, as such, rather than as something to take the place of a casting or riveted structure previously used.

The designs will be further simplified, using a smaller number of pieces and no doubt the amount of welding will be reduced. The tendency has been to employ a large factor of safety in the welded joints by specifying an amount of welding that in all probability is excessive; later practice will reduce this, based on further refinement of methods and more extensive field experience.

Present designs often call for the use of stiffener angles welded at heel and toe, where a straight bar welded on both sides would be equally good, this merely reflecting the engineer's experience with riveted structures where the angle would be necessary.

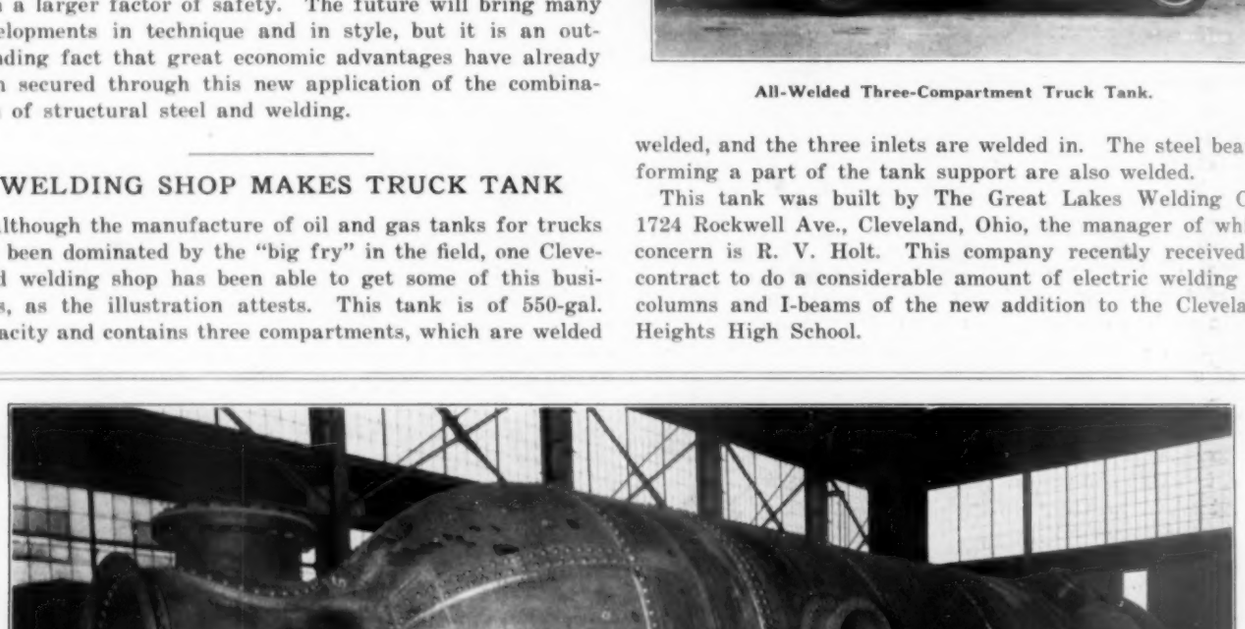
There have been in some cases an effort to copy the appearance of castings at a sacrifice of simplicity, instead of developing distinctive lines for the new construction. The practice today is to produce rugged, adequate structures with a larger factor of safety. The future will bring many developments in technique and in style, but it is an outstanding fact that great economic advantages have already been secured through this new application of the combination of structural steel and welding.

WELDING SHOP MAKES TRUCK TANK

Although the manufacture of oil and gas tanks for trucks has been dominated by the "big fry" in the field, one Cleveland welding shop has been able to get some of this business, as the illustration attests. This tank is of 550-gal. capacity and contains three compartments, which are welded leak-tight. The tank was made for the Green Springs Oil & Gas Co., of Green Springs, Ohio, and is as neat an appearing job as any one could wish for. All the seams are electric welded, and the three inlets are welded in. The steel beams forming a part of the tank support are also welded.

All-Welded Three-Compartment Truck Tank.

This tank was built by The Great Lakes Welding Co., 1724 Rockwell Ave., Cleveland, Ohio, the manager of which concern is R. V. Holt. This company recently received a contract to do a considerable amount of electric welding on columns and I-beams of the new addition to the Cleveland Heights High School.



The Welded Seams of This Fractionating Tower Are Covered With Butt Straps, Which Are Riveted and Welded.

WELDING USED EXTENSIVELY IN MAKING THIS FRACTIONATING TOWER

An unusually interesting example of riveted and welded construction is illustrated in the accompanying photograph of a fractionating tower recently completed in the Birmingham, Ala., plant of the Chicago Bridge & Iron Works. On this particular job, it was necessary to follow closely the specifications of the customer. Butt straps were used on the outside, as shown in the photograph. The main plates were bevelled on the inside of the joints and the V thus formed was entirely filled by arc welding, thus leaving the inside practically smooth. The welding on the outside along the straps in this case is unusually heavy, as ordinarily the outside welding need only be heavy enough for caulking purposes, which would not be over a $\frac{5}{16}$-in. or a $\frac{3}{8}$-in. weld. The step-back method of welding was used on the job, the weld metal being thoroughly peened and cleaned after each layer was deposited. Aside from the use of the step-back procedure, no special precautions had to be taken on this operation.

Pipe Welding in Buildings

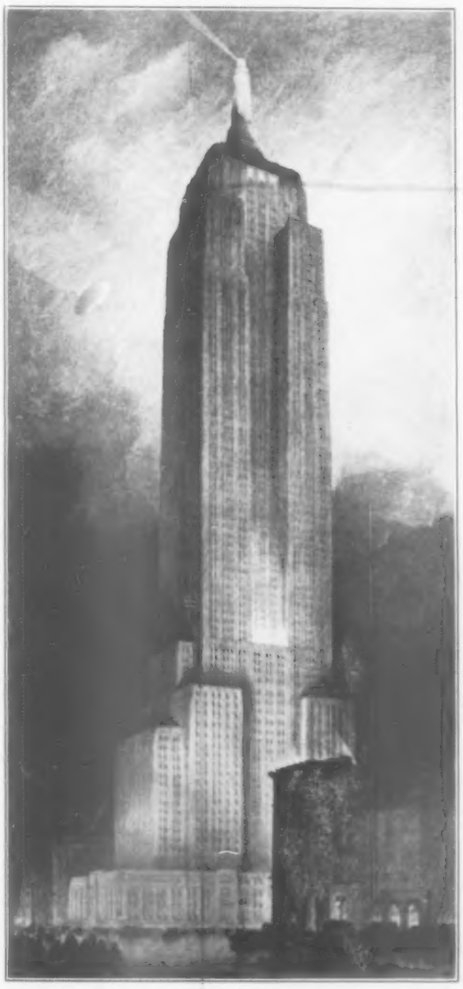
An Increasingly Large Number of Buildings of Major Size Are Using Welded Pipe Joints for a Wide Range of Service, a New York Survey Shows

By Charles Kandel* and Charles M. Whalen†

A SURVEY has just been completed of the metropolitan district of New York to determine the progress made in the use of welded pipe joints in building construction since the report made two years ago.

The survey disclosed a phenomenal growth in this direction which can best be shown as follows:

1. Heating and refrigerating contractors as well as architects and engineers are decidedly welding-minded.
2. Labor unions are doing constructive work in encouraging their members to take up welding, occasionally subsidizing the instruction with substantial appropriations.
3. Departments of public education are establishing free courses especially for pipe welders.
4. Numerous contractors are offering free facilities for practice in pipe welding to their employees to enable them to develop skill in the art.
5. Established welding schools are perfecting their courses and making them especially suitable for pipe fitters.
6. The supply of reliable welders in the pipe fitting industry is growing constantly as a result of these activities.
7. Contractors frequently request the privilege of welding pipe joints and obtain it without any difficulty.
8. Welded pipe joints are being specified on many buildings without any other alternative.
9. For headers and main line installation the welded joint has become the standard for workmanship, economy and dependability.
10. An astoundingly large number of buildings of major size and importance having welded pipe joints for a wide range of use, are a monument to an art now become a major industry.



The Empire State Building, Which Is Nearing Completion, Employs Many Miles of Piping Utilizing Welded Joints.

Following is a partial list of some of the more important buildings in the Metropolitan District of New York in which the welded pipe joint has been used extensively or almost exclusively:

Office Buildings

Aetna Life Insurance Co.
Bank of Manhattan
Chrysler
City Bank & Farmers Trust
Empire State
Irving Trust
New York Central
New York Telephone Co.
Nineteen Rector Street
Radio Corporation of America
Royal Insurance Co.
Salmon Tower Annex
Tammany Hall
Two Seventy Broadway
Western Union

Hotels

Dixie
Governor Clinton
New York Athletic Club
Paramount
New Yorker
Piccadily
Waldorf Astoria (New)
Wellington

Apartments

El Dorado
London Terrace
Sailors Snug Harbor
San Remo

Factory and Service Buildings

Brooklyn Union Gas
Chrysler Service Station
Consolidated Gas
Eskimo Pie Corp.
Ford Motor Assembly Plant
Fox Film Corp.
I. R. T. Power House
Knickerbocker Ice Co. (3 Units)
Loeser's
R. H. Macy & Co.
New York Auction Rooms
New York Edison Co.
New York Steam Power House
Packard Service Station
Park and Tilford
Reid Ice Cream Co.
Rubel Ice Co. (3 Units)
United Electric Light & Power Co.

Schools and Other Public Buildings

Evander Childs High School
Floral Park High School
Adams High School
Lincoln High School
Jamaica Public Library
New York State Office
Public Schools (27 Buildings)
Tilden High School
Far Rockaway High School

Theaters

Fox (2 Units)
Hammerstein
Hollywood
Loew's (4 Units)
Montauk
Park Lane

Hospitals

New York Hospital & Cornell Medical Center
Brooklyn State Hospital
Bronx Hospital
Presbyterian Medical Center
Kings County Hospital
Lenox Hill Hospital
Lincoln Hospital
Mother Memorial Hospital
Rockland State Hospital

Advantages of Welded Pipe Joints

The rapid growth of the welded pipe joint has resulted in numerous benefits of definite character among which are the following:

For the Owner.—Freedom from leaks and costly repairs assured for the life of the pipe.

*General Manager, Craftsweld Equipment Corp.
†Sales Manager, Craftsweld Equipment Corp.

For the Contractor.—A method of installation that is highly flexible, thus eliminating costly delays, bulky equipment, all special fittings, and which above all assures freedom from worries as to possible defects that might develop after the pipe system is in actual operation and still under maintenance.

For the Erecting Engineer or Supervisor.—A means of solving numerous vexing problems in modern building construction such as unforseen obstructions, limited clearances, changes in layout, irregular bends and twists, and similar factors which have hitherto taxed their resourcefulness to the utmost.

For the Pipe Fitter.—The introduction of a handy tool, more easily operated than the heavy wrench or chain and

Modern Buildings, Such as the London Terrace, Use Modern Methods of Construction, Which Means Welded Pipe Joints.

tong, less fatiguing and decidedly less hazardous to use on scaffolding or on the ground.

The survey also disclosed that in discussing the welded pipe joint with any of these groups it is no longer a question of convincing them of its desirability. They are thoroughly sold on it, from every angle. The discussion is more likely to touch upon the latest "kink" in its application, the most striking example of its diversity of use, its readiness to "save the day" by solving a vexing problem, or attempts at applying it in preference to the screw or flange joint, even at a slightly higher unit cost, because of other economies or conveniences resulting from its use.

For low pressure installation some authorities have heretofore recommended welded joints on pipe 3 to 4 inches in diameter and over. Many contractors are frequently welding low pressure system even below 3 inches and find it economical to do so under many conditions.

Contractor's Procedure in Adopting the Welded Pipe Joint

The procedure generally followed by the heating and refrigerating contractor who desires to use welded pipe joints in his installation is the same as outlined in the survey of this field two years ago with the added advantage of a larger supply of skilled welders, engineers and foremen. Briefly the plan is as follows:

1. Employing an experienced pipe fitter who has developed adequate skill in welding and whose work has proved thoroughly reliable after testing. There is a good supply of such men and their records can be traced readily.

2. For numerous projects on a major scale it may also be desirable to have an engineer or foreman experienced in this work or, if desired, the contractor's foremen or engineers can be sent to one of several recognized evening schools for a short course of training. At the prevailing scale of wages and under conditions usually prevailing on building construction it is not economical or practical to undertake the training of welders or supervisors on the job.

3. Ordering the pipe to be welded delivered on the job unthreaded and when possible with beveled edges, eliminating all fittings and couplings, as they will not be needed.

4. Securing a complete outfit from a reliable manufacturer having dependable service facilities locally and arranging for a supply of oxygen and acetylene to be delivered on the job. The cost of the outfit which should include both a welding torch and a cutting torch will be less than $200, including assorted welding rods sufficient for several months. This outfit will last for many years with negligible maintenance cost and invariably pay for itself out of savings on the first job.

5. For complicated connections patterns may be used as a measure of economy. These patterns are made by the welder or in the contractor's drafting room or, if desired, are available in suitable waterproof material for hard usage in the field.

The Welded Pipe Joint—Cut, Fit and Weld

The welding of pipe joints is a very simple procedure and the following outline will bear repeating:

"The pipe is cut to size on the job with the cutting torch, an operation requiring about 20 to 40 seconds for a square

The Chrysler Building Is Another Monument to the Skill of the Pipe Welder.

end on 4-inch to 12-inch pipe. By holding the torch at an angle while doing this, the edge is automatically beveled in preparation for welding. If an ell, tee or "y" is required the pipe is marked with a template and cut along the lines marked. The ends are then fitted together and welded on the ground when convenient or else in the hangers, without any difficulty.

No pipe cutting or threading machines are needed on the job. No pipe cut to sketch and threaded at the mill or shop will be required. Heavy scaffolding are eliminated.

There is no fear of being held up for shortage of specials, for obstacles in the building or difficulty because of limited clearances. With an ample supply of stock pipe on hand the work continues without delays. Just cut, fit and weld —straight runs, ells, tees, "y's," reducing nipples, any angle, anywhere, with less concern for the contractor, less fatigue for the pipe fitter and greater assurance for the owner of permanent freedom from leaks. If a welded joint is tight when tested it will stay tight for the life of the pipe. In fact, the joint is actually more durable than the pipe because of the extra thickness of metal fused into it with the welding torch.

This practice is being followed with very satisfactory results and enthusiasm beyond expectation. And "those who came to scoff now remain to pray"—for more pipe welders and more specifications calling for welding exclusively.

So strong is the faith of the contractor in the welded joint and that he can use it profitably, that it is not unusual to find one bidding on a job in which welding is specified without having a single welding outfit or a capable welder. He is confident, however, that he can secure both and complete the job satisfactorily to all concerned. "If others are doing it, I can do it." And he does. The facilities are now available and he is using them.

It is a significant fact that no contractor who has used welding during the past two years has ever abandoned it. They continue using it more and more extensively and more profitably. As time passes the contractor develops new refinements and short cuts in preparation, layout and control. And the promise made two years ago has been fully redeemed, the pipe fitter who has trained himself to become a skilled welder is "the first to be hired and the last to be fired." His earnings during the last 24 months have probably averaged at least 50% greater than those of a pipe fitter who has failed to qualify as a welder.

Incentives for employing the welded joint are very clearly defined to everyone concerned. Those who forsaw its wide use and acted two years ago have been reaping substantial rewards. The art is still young, and growing very rapidly. Those who will find a ready market for their craft.

TELS ASK FOR RELIEF FROM RIVETING DIN

That the building code of New York City be amended to make compulsory the fusion welding of structures to be erected in that city, is the demand made in letters from a number of the metropolitan hotels to Mayor James J. Walker. The initiative for this campaign against distressing noises was taken by the Knott Hotels Corp., who have enlisted the aid of other hotels in the movement.

It is pointed out that the Noise Abatement Commission in its recent report named riveting as the chief contributor to the bedlam which now agitates the city, and the hotel managements express the opinion that "this particular unnecessary noise constitutes a menace not only to individual health and efficiency, but to trade and normal business well-being," and that unless it is lessened many New York businesses, and especially the hotel business, will suffer. "Out-of-town people," it is stated, "will shorten their stop-overs and even cancel their customary visits to a city where sleep is made impossible and where their rightful rest is denied them by excessive noise."

The hotel men take the attitude that ordinances to restrict riveting to certain hours of the day will not relieve the situation from the hotel standpoint. They praise the work of the Noise Abatement Commission, but suggest that they make further inquiry into the matter of fusion welding, which, they point out, is now being used successfully for construction work in many American cities. The recommendation is also made that New York's building codes be amended immediately to "recognize and make compulsory fusion or arc welding in construction."

WELDED LIGHT-WEIGHT BOAT MADE OF TUBING AND SHEET STEEL

Experiments with steel tubing as structural members point to the fact that this type of section can be used to advantage in many kinds of construction, of which airplane fuselages is one of the best known examples. When a load is applied to a length of tubing such as to produce a bending moment, the tube section offers a high resistance to the bending moment, which resistance is the same regardless of the direction in which the load is applied. Hence, as a member in many types of structures, the tube is the most economical section from the standpoint of weight that can be devised. Moreover, the ends of tubes are easily joined

Boat Hull Made of Tubing With Welded Joints.

by welding, and the joints thus made are as strong as the tube material itself. Many such joints that offer no difficulty in construction where tubes are employed are difficult if not impossible to make in the case of angles, channels, I-beams or other common rolled sections. Thus the welded tubular structure is not only light in weight but economical to construct.

That the use of tube construction with welded joints may invade the field of small water craft is indicated by the recent building of a boat of this type by the Bradford Electric Co., of Kansas City, Mo., for use in river transportation, in anticipation of the opening of the Missouri River channel to St. Louis in 1931. This first model is an experiment as to design and engine size, but as soon as the new channel is open the manufacturer plans to make these boats on a production basis to supply the anticipated demand.

This boat is 30 ft. long and 5 ft. wide, and, without the engine, is light enough to be handled in and out of the water by two men. The illustration shows the hull of the boat, which is made of ½-in. Steeltubes, approximately 500 ft. being used. All joints were welded, and turns and bends were made on a Steeltubes bender. The welded tube frame was covered with sheet metal with all seams welded. Complete without passengers or freight, the boat draws only 2 in. of water. Properly powered, it will attain a speed of 50 miles per hour.

This type of construction for boats is considered to be very much cheaper and better than wood, the cost saving on a production basis being estimated at 25%. This is but one of a long series of examples of where the conventional design of water craft has been changed with resulting economies in construction and the use of longer-lived materials. In all such cases, welding has played an important part.

Pointers on Resistance Welding*

The Expansive Field for Resistance Welding, Various Forms of Welding, Preparation of Material, and Welding Procedure, Are Given Consideration

By R. T. Gillette†

FOR the sake of simplicity, resistance welding will be roughly divided into several different groups.

Spot, projection, line, butt, resistance annealing, flash, and resistance soldering and brazing.

Each group will be considered separately and examples shown of each group.

Spot welding is probably the most simple and best known,

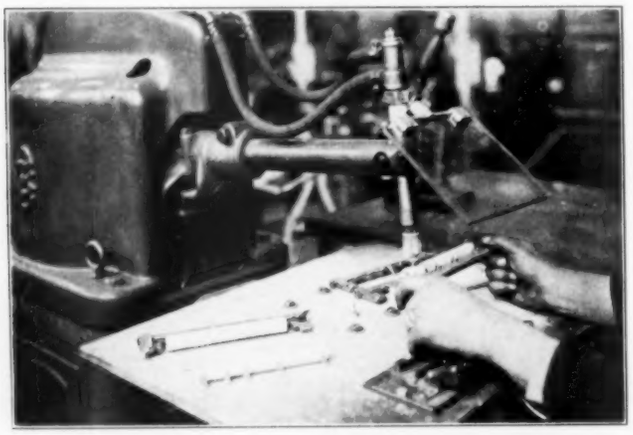


Fig. 1. Spot Welding Connection Bands on Tube Resistor.

and also the most widely used of any form of resistance welding.

The equipment may vary from a welder of less than 1 kw., used for welding small light parts such as wires and vacuum tube parts, to one of several hundred kw. capacity used for welding very heavy material in steel or other metals.

The three variables, time, pressure and current are adjustable through a fairly large range so the choice of equipment does not have to be made with a great deal of accuracy.

For the majority of work a power driven spot welder of the press type with either cam or toggle push-up is more satisfactory than a foot operated welder as it removes the human element with its factors of fatigue and indifference, and consistently gives a uniform welding cycle.

*A paper presented before the meeting of the American Welding Society March 11, 1930, in New York.

†General Electric Co., Schenectady, N. Y.

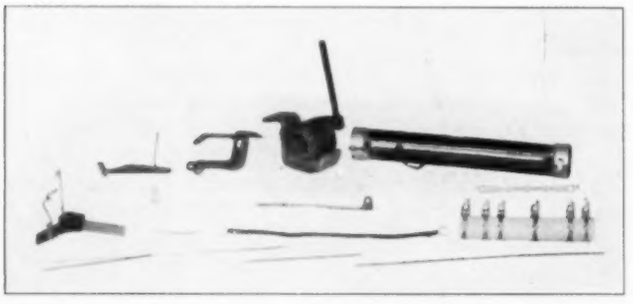


Fig. 2. Spot-Welded Copper Wires, Connector Parts, Tube Bands, Switch Parts.

Spot welding is not confined to welding the ferrous metals but may be used for many non-ferrous metals and combinations of dissimilar metals.

Variety of Work Possible

Dissimilar metals are most easily welded by the proper combination of electrodes made from different grades of tungsten and copper tungsten to give a balanced heating effect.

Many people seem to think it is not practical to weld pieces of different thickness together. This is entirely feasible and metals as far apart as .010 inch to one inch can be successfully welded.

Several pieces may also be welded together. For example, 16 pieces of $\frac{1}{16}$-inch steel have been spot welded together.

Fig. 1 shows the ends of copper bands being spot welded around porcelain tubes. The spot weiding of this type of

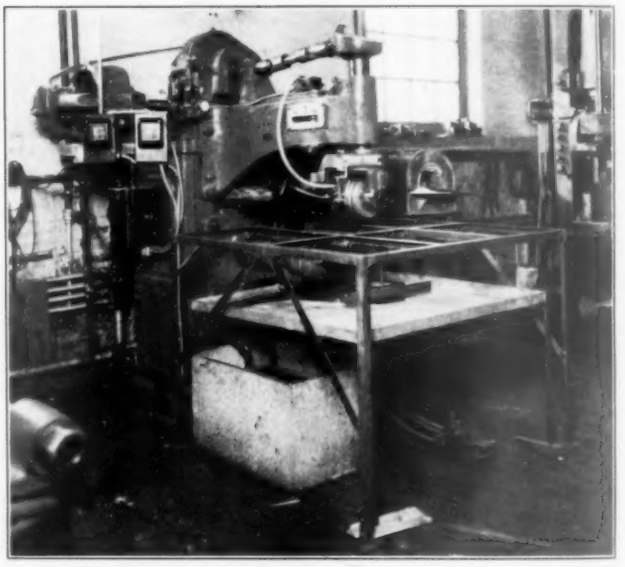


Fig. 3. Line Welder Being Used for Developmental Work.

joint is much easier if tinned copper is used for the bands. This type of joint is not to be confused with soldering, as only a slight wash of tin is used. This starts the weld and the tin is all alloyed in the joint, and the joint will not fail if heated to a red heat. Tungsten electrodes are used for this job. A miscellaneous collection of spot welded terminals, wires, bars, and other copper parts, is shown in Fig. 2.

Projection welding is really a form of spot welding, although it is more easily controlled, and several welds may be made at one time as the current is localized by the use of projections in the material instead of by the welding electrodes.

The same type of welder is used as in spot welding. Only the electrode construction is different—in most cases being only large flat plates or bars with plugs or facings of some hard high conductivity electrode material like Elkonite.

Projection welding is a very satisfactory type of weld, and a uniform product is easy to maintain.

The equipment for projection welding should be selected

with plenty of transformer capacity so the welds can be made with a short time cycle. It should also be made mechanically strong to insure long life with the high speed and pressure at which they operate.

Line or seam welding is really a series of overlapping spot welds, and is made between two copper wheels connected electrically in the manner of the electrodes on a spot welder.

An interrupter is usually placed in the primary circuit of the welder which interrupts the current usually five or more

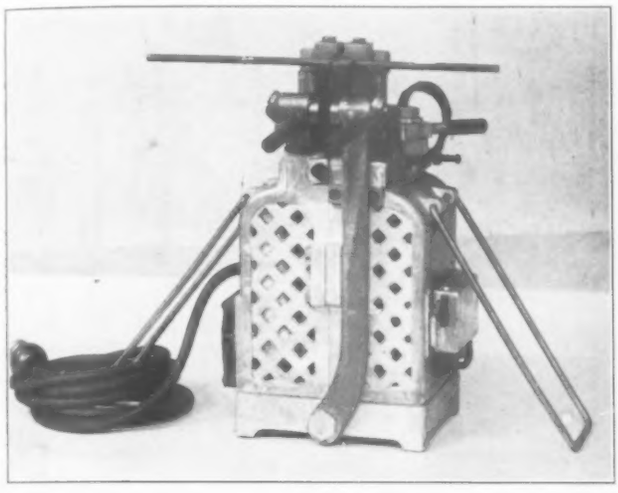


Fig. 4. Portable Butt Welder.

times per inch of weld. This allows higher current values to be used and results in a more satisfactory weld without danger of burning holes through the parts being welded.

This type of weld makes a joint tight to hot oil, vacuum or pressure, and is a very satisfactory type of weld to use for fabricating tanks, barrels, diaphragms, and many other types of sheet metal containers.

Brass, monel, everdur, aluminum, and other metals and alloys as well as steel are being line welded.

Line welds are usually made with water being poured over the top area and forced against the bottom area of the pieces being welded, which gives the effect of a weld being made under water. This holds the temperature of the parts

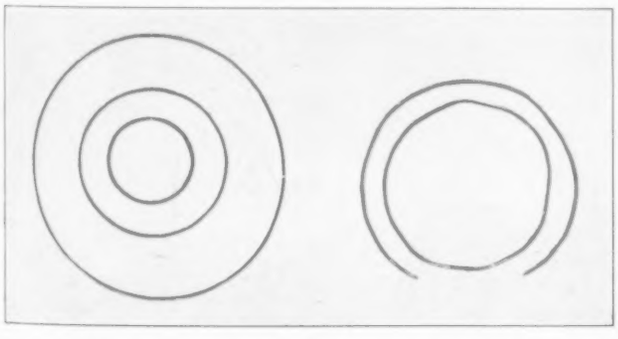


Fig. 5. Views of Aluminum Gasket Rings Before and After Butt Welding.

to the minimum and prevents excessive warping. Fig. 3 shows a general purpose line welder, being used for experimental work.

Butt welding is done by clamping the two pieces to be welded in the proper clamps in the welding machine, and bringing their ends together with enough pressure to prevent arcing or flashing; then passing current through until the parts are heated to the welding temperature; then pushing them together to complete the weld. This pressure may be applied by hand, spring, or falling weight, or other mechanical means.

Fig. 4 shows a ½-kw. butt welder used for small tubes, wires or rods. This will weld up to about ¼ inch round steel. Some of these welders are in production welding aluminum wire rings.

Welding Non-Ferrous Materials

Butt welded aluminum rings used for gaskets are shown in Fig. 5. Many non-ferrous metals and alloys may be butt welded, aluminum and most of its alloys, copper, brass, lead, and many alloys. One interesting butt welded combination has recently been made; that is, copper to aluminum. This has many applications where aluminum is used for a conductor, on account of its light weight and moderate cost, and copper is needed for a connection to bus bars, switches or other apparatus where a mechanical joint to aluminum is not satisfactory.

This weld is satisfactory, as practically all the copper-aluminum alloy formed is squeezed from the joint in the final push-up, giving a joint with copper to aluminum with no intervening layer or copper-aluminum alloy which is very brittle.

A spot weld cannot be made between copper and aluminum as the alloy is all included in the weld which makes it very brittle and weak.

Flash welding is done on the same type of equipment

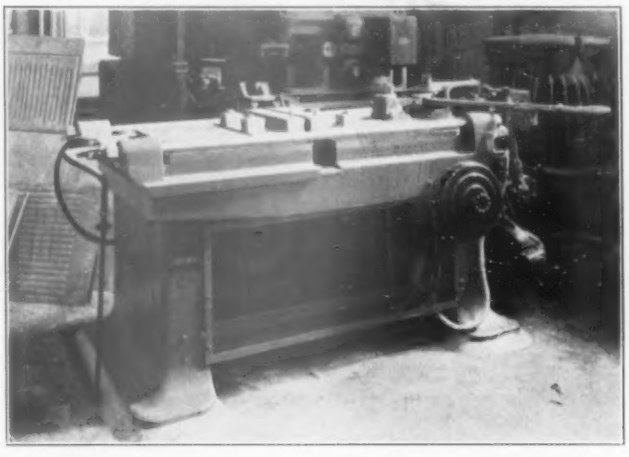


Fig. 6. Flat-Top Flash Welder for Developmental Work.

as butt welding, only the procedure is slightly different. The pieces to be welded are clamped in the welder, the current turned on, and the pieces moved toward each other until light contact is made. When the pieces start to flash, this forward motion is continued at a constant speed until the proper welding temperature is reached when the pieces are quickly pushed together to complete the weld. The current is turned off at the start of this final push-up.

Flash welding makes a joint of excellent quality, as any dirt or oxide is thrown from the weld during the flashing period.

Flash welding is particularly good where the parts are to be vitreous enameled, as the weld is free from pin holes and other defects that would cause defects in the enamel.

Fig. 6 is an experimental flash welder with cam push-up. This machine is not fitted with clamps as it is used for experimental work and any type of clamp may be used, or parts to be welded may be clamped direct to the top of the machine.

Resistance welders may be used to good advantage for spot annealing and other anneals. Fig 7 shows a butt welder fitted to spot anneal a shaft which is case hardened. These

shafts become sprung in the hardening process, and have to be straightened. The shaft is clamped in the welder with about ½ inch between the jaws, and current passed through to heat it to a bright red. This only takes a few seconds. When the shaft is hot it is taken from the welder and straightened hot in a small arbor press with a dial indicator to indicate when it is straight. After straightening it is dropped into a tank of water and quickly cooled so that the total length heated is very short.

Soldering and Brazing With the Resistance Welder

Soldering, silver soldering, and brazing are very easily done with different types of resistance welding machines. All that is necessary is the addition of special electrode construction.

For light work tungsten electrodes are generally used, and for heavy work carbon blocks are satisfactory. These different electrodes are so arranged that the current passes through the electrode and the work; the heat builds up rapidly in the electrodes and is transferred to the work, bringing it to a temperature where the solder, silver solder or brazing material melts.

This method of soldering and brazing is very fast and clean, and usually the resulting job is not badly oxidized.

In conclusion it might be said that resistance welding in some form might be used with considerable saving where

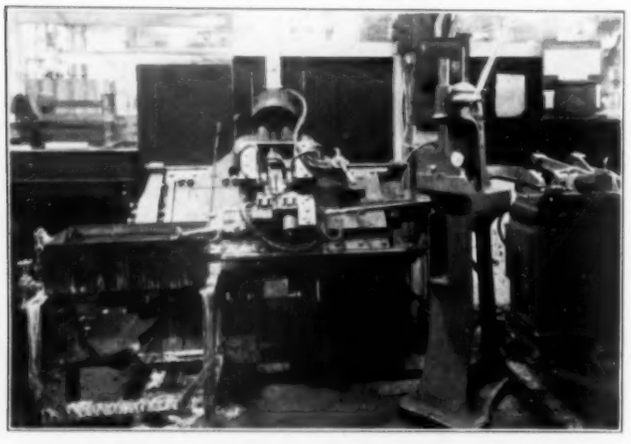


Fig. 7. Butt Welder for Annealing Shaft for Straightening.

rivets or screws or some such type of fastening is now used. The equipment requires less floor space and the job less preparation and fewer operations, and also eliminates a great amount of noise.

Considerable thought should be given to the design of electrodes and locating fixtures for the different welding methods, and many times a small change in design of the product will greatly facilitate welding.

If they are as carefully worked out and built as the jigs and fixtures on any precision metal working equipment, a precision job of welding will result.

Whenever possible, resistance welding machines should be operated mechanically to give a uniform product and eliminate the human element.

Material to be welded should be clean and free from scale if a satisfactory result is desired.

Electrodes and fixtures must be maintained at the proper shape and size.

It is false economy to buy equipment under capacity because it is cheap, as many welds, to be satisfactory, have to be made with high energy input and short time, as this reduces oxidation and excessive heat outside the weld.

The welding circuit should be kept as large as practical through fixtures and electrodes to the point of weld, so the machine will not heat excessively or have its capacity cut down.

NEW YORK WELDING CONTRACTORS FORM AN ASSOCIATION

A trade association of the welding contractors in the metropolitan district of New York was formed on September 9th at a meeting at which the following companies were represented:

Astoria Star Welding Service
Bournonville Welding Co.
Electric Welding Co. of America
Hallen Welding Service, Inc.
Helwig Welding Co.
Hutton Welding Co.
Michaels & Mourre, Inc.
Smith Hamburg and Scott Welding Co.
Sound Welding Co.
Weldrite Co., Inc.

The purpose of the organization is to give the members the advantages of all the regular activities of a trade association. These would include credits, statistics, standard cost finding and estimating, records of available welders, uniform trade practices, joint action on regulatory legislation and the licensing of master welders. In addition, and at least as important as any other function, facilities will be provided for bringing competitors together to discuss their problems and to come to understand each other better and to learn to work together for the common good.

The initial members of the new organization elected a temporary Executive Committee to prepare by-laws, outline a program, and report back at the next meeting. The temporary Executive Committee consists of president, Harry E. James, Bournonville Welding Co., New York City; treasurer, M. Hallen, Hallen Welding Service, Inc., Long Island City, N. Y.; J. J. Dancy, Weldrite Co., Inc., Long Island City, N. Y.; A. F. Keogh, Sound Welding, Inc., New York City; and Chas. Michaels, Michaels & Mourre, Inc., New York City. Stewart N. Clarkson, formerly executive secretary of the Electric Power Club and assistant director of the National Electrical Manufacturers Association, was elected executive secretary.

MR. JAMES H. EDWARDS DIES SUDDENLY

James H. Edwards, chairman of the Structural Steel Welding Committee of the American Bureau of Welding, died suddenly on Aug. 14 after a few days' illness. Mr. Edwards was chief engineer of the American Bridge Company, and was born in Oxford, Chenango County, New York, June 19, 1864. He graduated from Cornell in 1888. He entered the employ of the Berlin Bridge Company as structural draftsman. In 1897 he was appointed as chief engineer. The company pioneered in the steel frame type of industrial building and, through Mr. Edwards, developed it to high perfection.

Mr. Edwards was gifted with remarkable clear-sightedness in technical matters and with an open mind. He took up the study of fusion welding and became convinced of its possibilities. He made tests and induced his company to establish a welding shop at its Trenton plant. New forms of structural design and detail suited to welding were developed under his supervision. Many of the important welded buildings came into existence largely due to his combined engineering and business vision. He took an active part in the work of the American Welding Society, became its vice-president and chairman of the Structural Steel Welding Committee, and organized for this committee an elaborate series of tests to secure fundamental design data on the application of welding in the structural field, which tests are now in progress. The Samuel Wylie Miller Medal of the Society was awarded him for conspicuous contribution to the advancement of the welding art.

In addition to his activities of the American Welding Society, he served as director of the American Society of Civil Engineers in 1913, was a member of numerous committees of this Society and other engineering organizations. For fifteen years he was Trustee of Cornell University.

Welded Steel Makes Better Punch Presses

These Presses Have Advantages in Weight, Rigidity, Cost, Quietness in Operation, Adaptability in Design, and Light Inventory Requirements

THE substitution of steel plates, cut to shape and welded together, in place of castings in punch-press construction, offers one of the most interesting examples of how rigid requirements have been successfully met and at the same time the product has been reduced in cost and weight and how its quality has been bettered in several respects.

A false idea that used to be accepted generally by machinery buyers and users and which is gradually being abandoned, is that rigidity and strength are increased by adding weight. However, it is now recognized that the kind of materials employed and the design are often more important factors than weight.

Cast iron is generally assumed to be inelastic because every one knows it is a very brittle material. Yet, of two bars—one of cast iron and one of mild steel—both being of identical shape and size, the cast iron bar will show much greater deflection when tested as a simple beam than will the bar of mild steel under a similar test. There are many who will be surprised at that statement, but the accompanying table giving data on tests conducted at the Armour Institute of Technology, Chicago, bear it out. The chemical analysis of both bars is given and the deflections under various loads. It will be noted that over the range given, up to the breaking load on the cast-iron bar, the deflection of the mild-steel bar averaged only about half that of the cast iron.

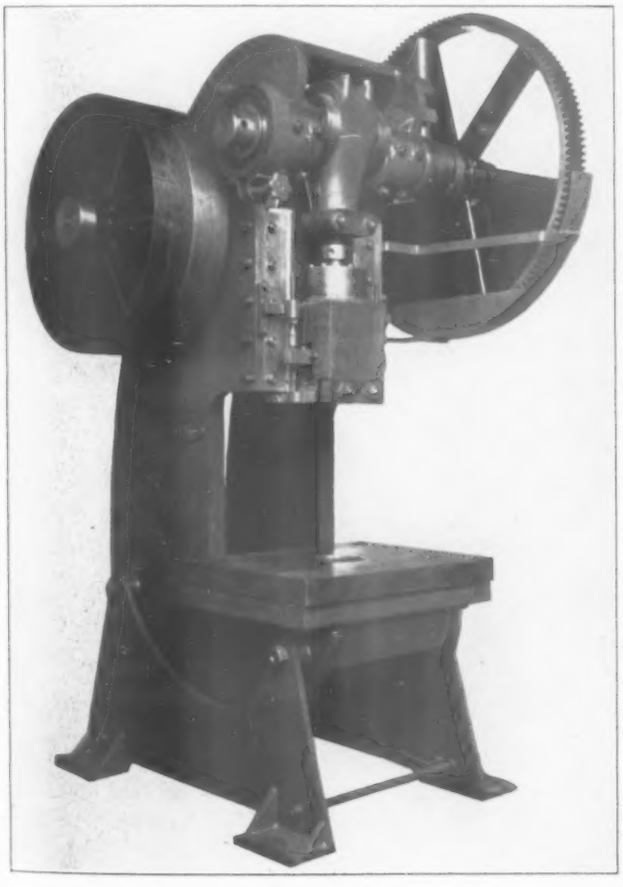


Fig. 1. Heavy-Duty Inclinable Press Constructed of Welded Steel Shapes Cut from Plate.

These facts seem to explode any idea regarding the superiority of cast iron over steel in constructions where

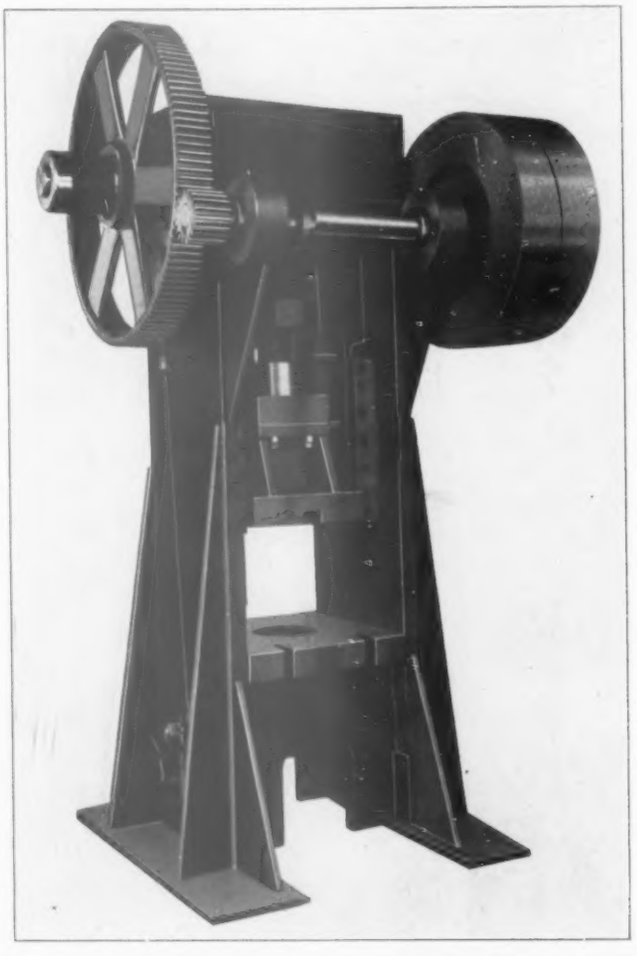


Fig. 2. Straight-Side Trimming Press with Welded Base, Overhead Support, Side Plates, Ram and Gear.

Results of Transverse Tests of Steel and Cast-Iron Bars.

(Span, 36.0 in. Width, 3.0 in. Thickness, 1.0 in.)

Load at Center, Lb.	Deflection at Center, In. Cast Iron	Mild Steel
200	0.046	0.027
300	0.075	—
400	0.102	0.057
500	0.123	—
600	0.148	0.072
700	0.173	—
800	0.203	0.113
900	0.230	—
1000	0.250	0.132
1100	0.290	—
1200	0.320	0.156
1300	0.350	—
1400	0.390	0.185
1500	0.425	—
1600	0.450	0.217
1700	0.490	—
1900	0.610	0.276
2130	0.720	0.315
	Broke	
2400		0.410
2600		0.540

Chemical Analysis (in per cent)—	Mild Steel	Cast Iron
Combined carbon	—	0.60
Graphitic carbon	—	2.94
Total carbon	0.20	3.54
Manganese	0.44	0.54
Phosphorus	0.013	0.278
Sulphur	0.033	0.077
Silicon	0.030	0.191

rigidity and accuracy are prime requisites, such as in punch-press construction. As a matter of fact a construction consisting of steel shapes assembled by welding has certain advantages, from the manufacturer's standpoint, over cast construction, such as flexibility in design to accommodate unusual requirements, speedy delivery after receipt of order, no burdensome charges when substituting an improved design for an old one, no large inventory of stock parts and patterns, and simplified finishing operations. From the point of view of the user of punch presses, some of the advantages of steel construction have already been mentioned.

The presses described in this article are made by the LaSalle Machine Works, 3013-17 S. LaSalle St., Chicago, Ill., and are sold under the trade name "Verson." The company is owned and operated by four Verson brothers, one of whom is the designer of the equipment described.

These presses present no problems in welding that are out of the ordinary. Mild-steel plate is used almost exclu-

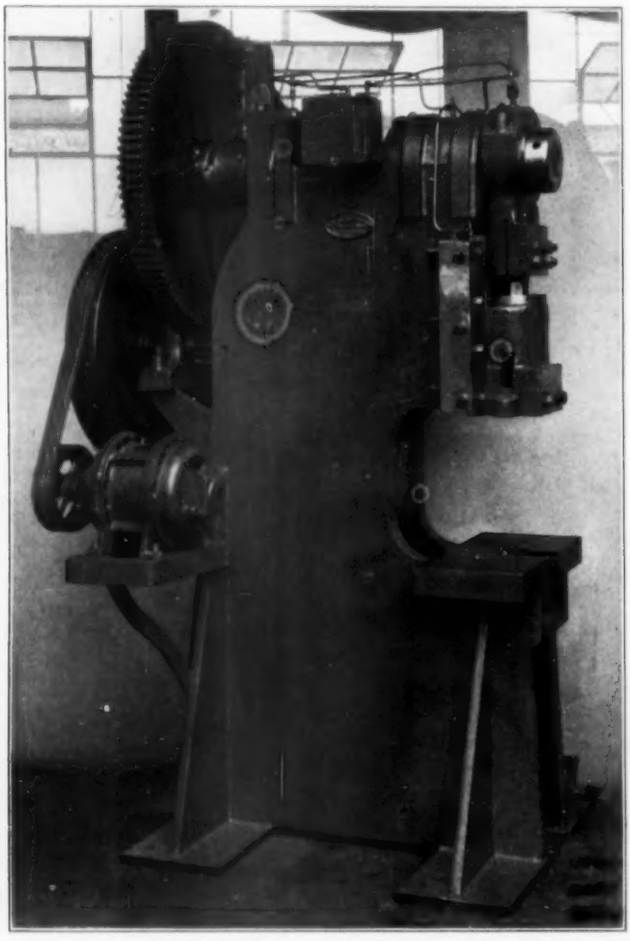


Fig. 3. Another Type of Arc-Welded Press.

sively, and fillet welds are employed, the weld metal being deposited by the arc in two layers. The pieces are assembled and tack welded together before continuous beads are laid.

The heavy-duty open-type inclinable press shown in Fig. 1 is almost wholly a welded steel product, even to the large gear and its guard. The legs, feet, bed plate, housing plates, overhead support, and bosses are cut from flat mild-steel stock and welded.

The large shapes are cut from rolled plate by means of a mechanical torch, and from the remaining scrap are cut such small pieces as ribs, bosses, brace plates, etc., which enter the press assembly. The hand torch is used for form-

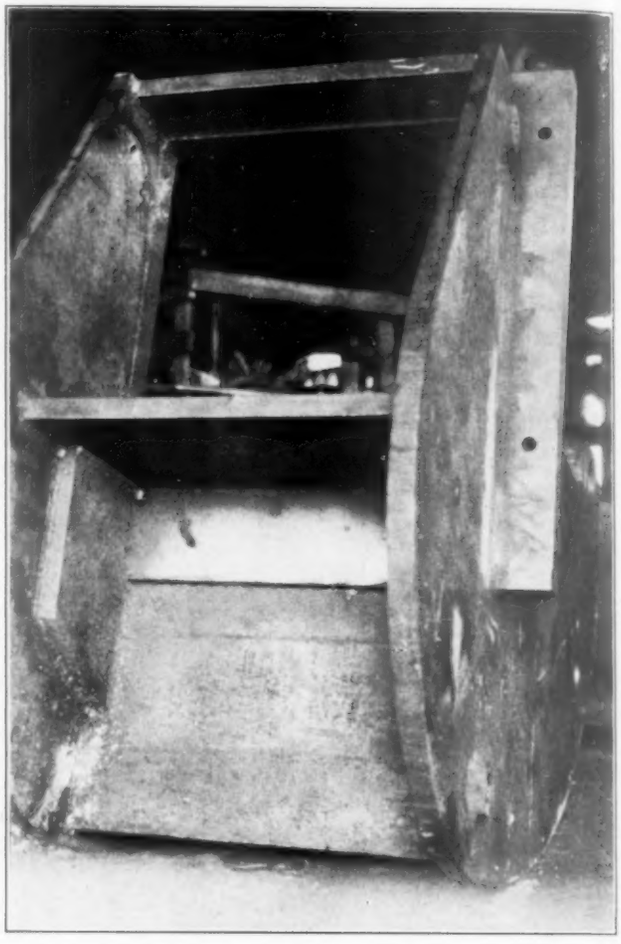


Fig. 4. Underside View of Inclinable-Press Body, Showing Side Plates, Bed Plate (With Large Square Opening), and Ribbing.

ing some of the small pieces. After welding, the units are machined to assure proper alignment.

In Fig. 2 is shown a straight-side, single-crank, single-geared trimming press. The frame is entirely of welded steel construction, as are also the ram and gear. Straight-side presses are also built with single, double, and triple cranks and with double gears.

Still another type of construction is shown in Fig. 3,

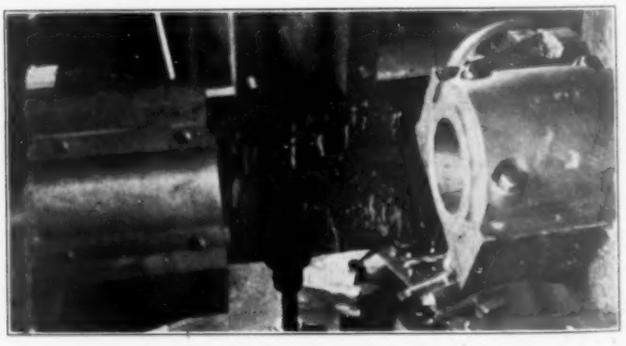


Fig. 5. Main Bearings of Frame Shown in Fig. 4.
(These are built up of shapes cut from steel plate and welded together in laminated style.)

which is a deep-throat punching press, the frame and gear of which are arc-welded units. In all these types, patterns and castings have been almost entirely eliminated, and this is reflected in a reduced cost and lower selling price as well as in a much lessened weight. Moreover, a sturdier and more rigid machine is produced.

The high rigidity of mild steel as compared with cast iron,

which has already been mentioned, was further shown in a test conducted on a 40-ton welded steel press of similar design to that shown in Fig. 1 and a cast-iron press of the same capacity and both having the same weight of fly-wheel. The object of the test was to measure the vertical distance between the die face and the bed plate at no load and at full load, with the ram in its lowest position. The difference would be the "spring" in the press caused by the load. For the cast-iron press this figure was 0.065 in., while in the case

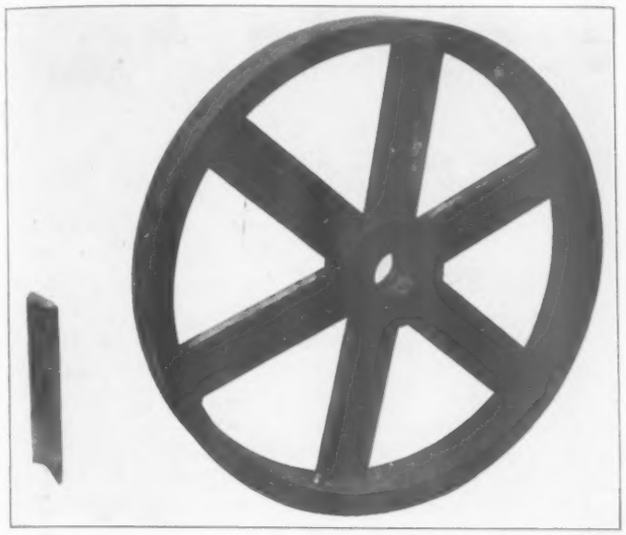


Fig. 6. All-Steel Gear Blank Fabricated by Welding. One of Arms Shown at Left.

of the welded steel press it was only 0.007 in., representing a ratio of approximately 9-to-1. This extreme rigidity of welded steel construction not only insures great accuracy in the stampings but reduces the wear on the dies, increasing both die and press life.

Fig. 4 is an under view of an inclinable body frame, showing the welded construction of the plate assembly.

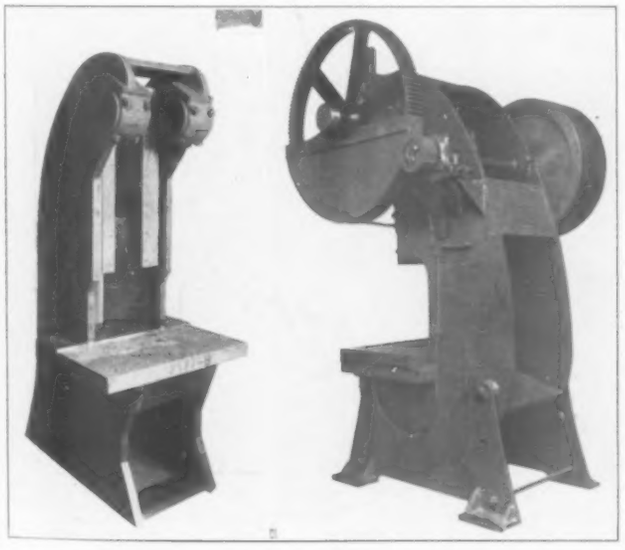


Fig. 7. These Presses Weigh One-Third Less Than Cast-Iron Machines of the Same Capacities.

(Punch-press frame after planing, shown on left, and the right-hand view shows the construction of an inclinable press.)

One of the main bearings can be seen on the right at the farther end of the frame. Both of the main bearings of this frame are shown in detail in Fig. 5. The bearing housings are built up of plates cut to the proper shape and welded to each other and to the side plate. The bearing is also supported by a stiffener plate welded to it and the side plate.

A welded gear blank like that used on the press shown in Fig. 1 is illustrated in Fig. 6, together with a view of one of the arms cut out of steel plate. The ring is made by rolling a piece of flat stock of proper size into a circle and then welding the ends together. The hub is cut from a piece of heavy plate. The parts are all assembled by welding, following which the teeth are milled out. Such gears are superior to cast gears, and are quickly made without the use of patterns.

The two presses shown in Fig. 7 represent the latest design in welded press construction made by this company. These presses weigh 30% to 40% less than equivalent machines of cast-iron construction. Tool steel is used for gibways in these presses, as mild steel for this purpose has a

Fig. 8. (*Below.*) All-Steel Punch-Press Frame Showing Method of Constructing Frame, Including the Welding of the Bearings and the Ribbing.

Fig. 9. (*Above.*) Side Plate for an Inclinable-Type Press.

(The piece lying on the ground is the scrap left from the original plate after cutting.)

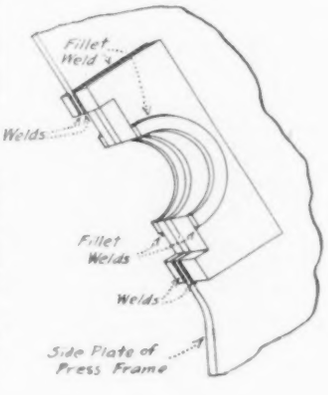


Fig. 10. (*Right.*) Illustrating Bearing Construction.

(Each half-bearing is built up of two pieces cut to shape from a steel plate and welded one on each side of the side plate of the press frame; then semi-circular pieces cut with the gas torch are welded on the outside of these, as shown. This makes a serviceable bearing that is cheaply and quickly constructed. The welds extend completely around the periphery of the flat shapes, except on the bearing side. After welding, the bearing itself is machined.)

tendency to cut. The ribbed construction of a press frame is clearly illustrated in Fig. 8.

One of the side plates of an inclinable press is shown in Fig. 9. It will be noticed that the bearing face makes an angle with the vertical edge of the plate. This angle of 30 deg. causes the shearing stress produced by the bearing to be taken up in the plate at a sufficient distance from the upper end of the plate as to provide plenty of strength.

The main bearings are built up of plates cut to size and shape and welded together, as shown in Fig. 10. Thus the side plate itself forms part of the bearing. After welding, the inside of the bearing is machined smooth.

The press shown in Fig. 2 will be used as an illustration of the sequence of welding and assembly. First, the base is welded into one unit, then the overhead support. These are then lined up and the two upright housing plates are welded to both units. Prior to the final welding operation, the housing plates as well as the base and overhead support are planed to insure proper fit and alignment. The frame is then bored out for the bearings, and the base plates and reinforcing angle plates welded on. Finally, the ram is assembled and welded and suspended in its proper place.

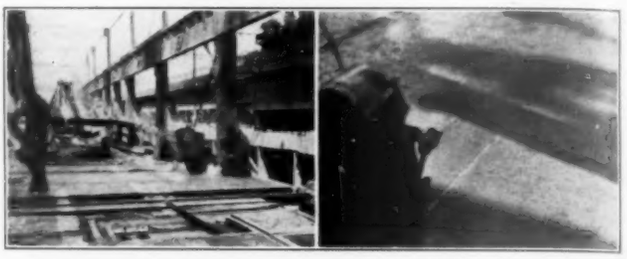
The extreme flexibility in design where welded construction is used is well illustrated by the fact that changes made necessary to accommodate unusually large dies or specially shaped materials can be made at practically no additional cost. For example, as the bed plate is torch cut, little or no additional expense is involved in changing the size of the opening in this plate. In the case of a casting, it would be necessary to make a new drawing and pattern. Likewise, the die space can be changed 2 or 3 in., or the depth of the throat can be altered without undue expense.

Despite their light weight, these presses operate with little vibration and therefore require no unduly expensive, elaborate foundation such as do the heavy cast-iron machines, and they are much quieter in operation than presses of conventional construction, which is another important factor in their favor.

WELDED FLOOR FOR OPEN-HEARTH BUILDING

An arc-welded floor of the "battledeck" type was recently built in the open-hearth-furnace building of the Inland Steel Co. at Indiana Harbor, Ind., by the Mississippi Valley Structural Steel Co. This floor was 35 ft. wide and 850 ft. long. Steel plates were employed, these being ⅜ in. thick and 2 ft. wide, and run parallel to the short dimension of the floor. Three lengths of plates were used—10 ft., 10 ft. 6 in., and 14 ft. 6 in. One of each size laid end to end made the necessary 35 ft.

These plates were laid on 6-in. and 7-in. heavy-weight standard I-beams spaced 24 in. center to center. The floor was so laid that the longitudinal seams between the plates fell over the center of the I-beams. By welding at the seams, the plates not only were welded together but were anchored to the I-beams. The I-beams rested on built-up girders 24, 30, and 36 in. deep, and were welded to the girders. The floor plates were tacked by arc welding on the under side at intermediate beams. There are 14,000 linear feet of welding in the job.

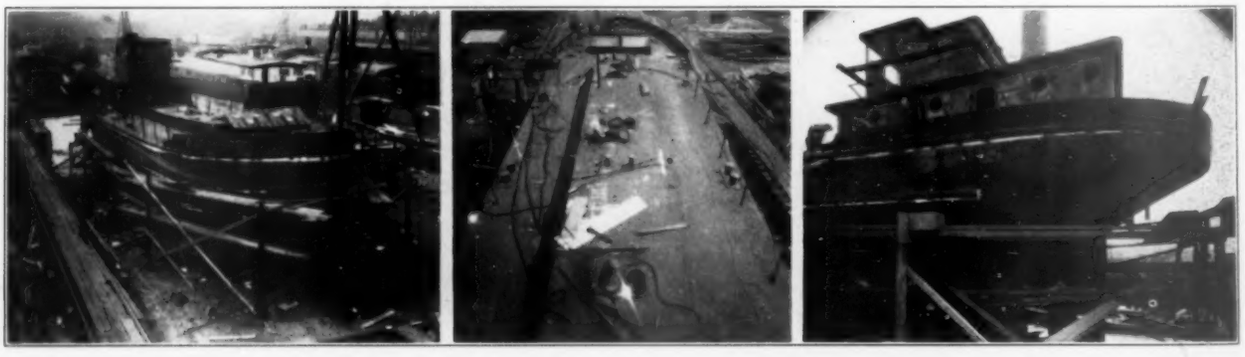


(Left) **Automatic Machine Welding Seams in Floor of Plate Steel. (Right) Close-Up View of Welded Seam.**

In the 850-ft. length of floor, there are two expansion joints. A standard-gage railroad track runs the full length of the floor, with 80-lb. rails are welded to the floor plates. At 12 points there are "hot metal" tracks running at right angles to the main track to carry the hot-metal cars into the open-hearth building, and these rails are also welded to the floor. The floor beams are increased in size or in number under these twelve tracks.

About 60 columns come up through the floor, around which the floor was patch welded to make weather-tight. Stacks, machinery supports, blowers, etc., also come up through the floor, and these had to be framed around.

The Mississippi Valley Structural Steel Co. designed and built their own automatic welder for this work. This machine is small and light in weight and has only one motor, which propels the machine and feeds the welding wire.



(*Left*) **View of 2,500-Barrel Tanker Under Construction.** (*Center*) **Looking Forward, With Partial View of Shipyard.** (*Right*) **Graceful Lines Are Retained, as Shown by This View of the Welded Hull.**

WELDED TANKER TO BE LAUNCHED SOON

A notable event in shipbuilding history will be the launching early in October of the motor-ship *Ira F. Bushey*, built by the lock-notched plate welding system, developed by Richard F. Smith, from the shipyards of Ira S. Bushey & Sons, Inc., Brooklyn, N. Y.

This 2,500-barrel oil tanker is constructed by the metallic-electrode welding process and contains not a bolt, rivet, or angle. It is estimated that 20% is saved in weight and 25% in construction cost. The vessel is 114 ft. long, 24 feet wide, with 10-ft. 6-in. draft, and will be driven by a 260-hp. full-Diesel engine.

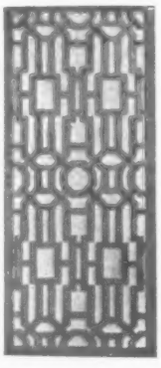
At least 60% is added to the strength of the ship by the use of welding, which means that greatly increased loads may be carried; and at the same time there exists less possibility of straining in heavy seas and storms. As there are no caulked seams to work loose, any possibility of leak is practically eliminated. Rolled steel plate, ⅜ in. thick, is used for all members.

By the use of the lock-notch system vessels of any type can be constructed from model, retaining designed curves and graceful lines. Moreover, there is no loss of flexibility, and no possibility of buckling or distortion. The application of this system and a complete discription of the building of this all-welded tanker, from laying of keel to launching, will be given in an early issue of *The Welding Engineer*.

Steel Shapes Cut to Order

A Massachusetts Concern Builds Up a Big Business in the Cutting of Shapes From Steel Plate to Replace More Costly Castings and Forgings

Magnetic-Chuck Face Plate.



One-Piece Grill Cut From ⅜-In. Plate, 6 In. by 2 Ft. 8 In.

Special Wrench.

Ornamental Work.

ONE of the most interesting possibilities for using the mechanically operated cutting torch lies in the production of steel shapes to order on a contract basis. There are a few shops in the country who have installed such equipment and who do a considerable volume of cutting for customers who want steel in a great variety of shapes.

In numerous large plants today one will see many parts which were formerly castings or forgings now being cut out of plate steel with a great saving in the cost of machining, and the production of parts with a uniformity of material throughout. Machine cutting produces clean and remarkably smooth surfaces, so smooth in fact that for many purposes further finishing is unnecessary; but where a finished surface is desired, only a light cut is needed.

A great drawback to more extensive use of the cutting machine has been that to get the best results an operator must devote a large portion of his time to this work. This means that a machine must be kept reasonably busy, and not every plant has work enough of this nature to warrant the installation of the equipment.

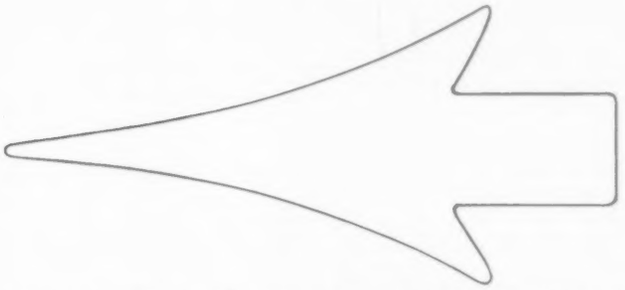
To meet the need for service of this kind, the Thomas Smith Company, Worcester, Mass., has for the past two years been operating a cutting department where they have cut such parts as gear blanks, cam blanks, heavy washers, ratchets, levers, stripper plates, etc. More recently they installed additional equipment to take care of larger requirements.

The Thomas Smith Company use city gas for fuel instead of acetylene. The nozzles are drilled to locate the focus about 1⅜ in. from the end. For usual work the cones of the six preheating flames are ¼ in. long. These are so adjusted as to mixture and pressure that the elongation caused by the cutting jet is hardly noticeable.

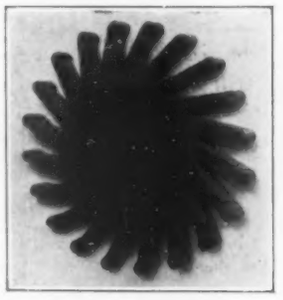
In cutting out such shapes as that shown in the illustration below, it is important that the points do not be melted off at the top. Therefore it is necessary to reduce the heat of the cutting flame when rounding the points, then increase it to the proper heat when reaching the wider metal.

The cutting of face plates for magnetic chucks calls for a wide kerf. A No. 42 or No. 44 drill cutting jet will make a kerf almost 3/32 in. wide with 12-lb. oxygen pressure. The usual face plates are ⅞ to 1¼ in. thick. Even the 1¼-in.-thick plate is thin for this nozzle.

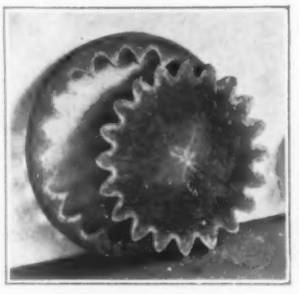
The No. 57 drill size jet is used for cutting 1/16 to ½ in.,



By Reducing the Heat of the Cutting Flame When Rounding the Points, Parts Such as This Can Be Cut Satisfactorily.



Wood Trimming Cutter.



Sprocket, 1 In. by 14 In.

Knife Cut From Tool Steel.

Cam, ½ In. by 8 In., Cut With Template.

the No. 52 size for material up to 2½ or 3 in., the No. 48 up to 5½ in., and the No. 42 for larger sizes.

As regards pressures, 18 lb. is the proper amount for ½-in. thickness, 20 lb. for 1¼ in., 35 to 40 lb. for 2 in., 50 to 55 lb. for 3 in., and 60 to 65 lb. for 4 in.

The usual recommendations concerning speeds for straight-down cutting are followed.

In the cutting of chrome alloys more heat is necessary. The preheating flame should be increased in fuel gas as well as oxygen.

The cutting of tool steel is helped greatly if the piece to be cut is preheated to about 700 or 800 deg.

Annealing is desirable after cutting, although blanks have been made that were machined without annealing.

Using a templet, cuts can be made to within ⅛ in. of the finished dimension, while from a blueprint a cut nearer than ⅛ in. to the finished dimension cannot be guaranteed. Therefore, in cases where close cutting is required a templet or pattern is made for the job; and where accuracy is not so necessary, the work is done directly from a sketch or blueprint. Plates up to 2 in. in thickness are carried in stock so that prompt shipment can be made on all ordinary requirements.

When factory executives become better acquainted with the possibilities of saving money by using parts cut from steel plate, it is likely that this sort of service will become increasingly popular and that the business of cutting will be an important source of income for the progressive job welder or machine-shop operator.

BATTLEDECK FLOOR FOR NEW GARAGE

Work is now being completed on the Berkshire garage at Pittsfield, Mass., which contains one of the largest areas of battledeck floor so far constructed since this particular system was first advocated by the American Institute of Steel Construction. The building is being erected for the Berkshire Auto Company of Pittsfield from plans by George E. Haynes, architect. The structural steel was fabricated, erected, and welded by the Haarmann Steel Co., of Holyoke, Mass., and General Electric welding equipment was used throughout.

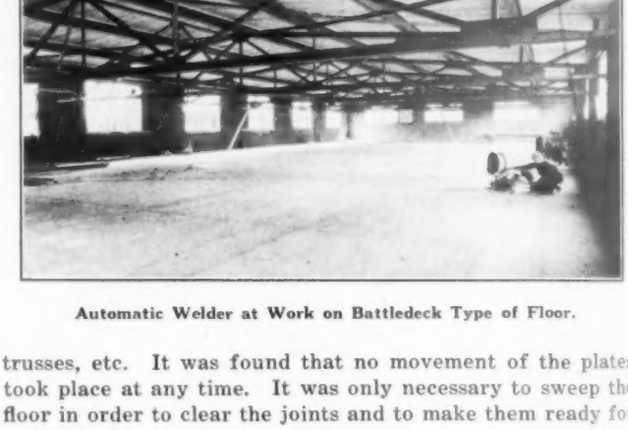
Unusual construction problems confronted the owners, and these were entirely solved through the use of the welded floor, and its advantages over the conventional concrete slab floor were demonstrated. The architect, George E. Haynes, found it necessary to erect a two-story addition in the angle of a one-story building with a ramp leading from the ground floor of the existing building to the second floor of the new structure. The space available for the ramp was of limited length and, as it was essential that the practical rise should not be exceeded, these facts determined the height of the second floor. It was required that the first floor be without columns. As the depth of the second-floor construction determined the ceiling height of the first floor, it was obvious that the ordinary concrete slab method of floor construction would have made the height in the clear less than that required by the owner. The span had to be cleared across the 60-ft. width and the girders not less than 20 ft. on centers.

Computations showed requirements of a 6-in. concrete slab and a 36-in. girder, making a total of 42 in. from the top of the second floor to the under side of the girder. This was more than could be used. The weight of the concrete was 75 lb. per sq. ft. and the girder was 300 lb. to the foot, in addition to the other steel.

The battledeck floor was investigated and it was immediately apparent that the height of the girder plus the thickness of the plate would be the total thickness of the floor. This showed a 33-in., 200-lb. girder, representing a saving of 80 lb. per sq. ft. on girders and of 9 in. in the depth of the floor.

The battledeck floor consists of 5-in., 10-lb. I-beams, spaced 24 in. on centers, with ¼-in. steel plates placed from the center line of one I-beam to the center line of the adjoining I-beam and from center to center of the girders. An allowance of ¼ in. between plates was made. The battledeck construction weighs 15 lb. per sq. ft. as contrasted with 75 lb. per sq. ft. for concrete slab construction. This startling decrease in dead load was surprising to construction men. It resulted in reduced column requirements and footings. The footings were very important as, in order to avoid cantilever, the footings extended under the existing walls at the column point.

The fabricators procured plates stretched and squared with a limitation of ⅛ in. plus or minus. The plates arrived on the premises by truck and were independently hoisted to the second floor and laid in place. The plates lay evenly at all points. This was done before any masonry work was done on the walls and without securing the plates in any way. The resulting platform was used by the other building trades for the construction of the walls, placing the roof on the



Automatic Welder at Work on Battledeck Type of Floor.

trusses, etc. It was found that no movement of the plates took place at any time. It was only necessary to sweep the floor in order to clear the joints and to make them ready for welding.

A total of 193 separate plates, each 2 ft. wide by 20 ft. long, were used, making a total area of 40x160 ft., or 6,400 sq. ft.

Deflection in the floor is very slight, and mostly in the center. Normally garages have floors built up in the center to drain water from ice-covered cars to side gutters. It was impossible to do this with the battledeck floor, so the center plate in each panel is cut out for a simple drain. This drain is connected with a 1½-in. pipe on the ceiling below to the side wall, and drains to two feet above the gutter of the first floor.

Deflection occurred only under load, and there is 100% recovery on removal of load. The floor is found to be clear and easily kept so; it is water tight and prevents any dripping on cars below.

Although the battledeck floor can be covered with any material such as cement, rubber tile, linoleum, cork, etc., it was unnecessary in the Pittsfield garage, as the steel floor provided enough friction to prevent skidding.

The total storage capacity on the battledeck floor is 64 cars. The total capacity of the garage with the addition is approximately 500 cars.

Various types of welds are possible, but the one used at Pittsfield was a flush weld, presenting a smooth surface all the way across the entire floor. The welds not only join the steel plates but also weld them permanently to the I-beams below, making an unusually rigid joint and one which is very resistant to stresses of all sorts.

Hints for the Welder

WHEN YOU FIND a new way to do a hard job, or finish a particularly interesting weld, can you describe how the work was done? . . . . . Have you learned some little stunt every welder ought to know? . . . . . Write to us about these things . . . . . This department helps you welders to help each other. Write up your ideas any old way and just make rough pencil sketches . . . . We'll fix them up for publication.

CARE OF YOUR WELDING EQUIPMENT

By R. K. Randall

Some years ago C. J. Myquist wrote a series of articles for *The Welding Engineer*, which have been reproduced in *The Welding Encyclopedia* under the title of "The Use and Misuse of Oxy-acetylene Equipment." I certainly believe that every man using oxy-acetylene welding apparatus or contemplating using oxy-acetylene welding apparatus whether from the manufacturer's view or the operator's view should read this interesting and complete article.

The manufacturer who uses welding in his plant should be interested enough to learn what hazards are present in his welding department and should know that he individually or his supervisors, safety workers, and subforemen understand some of these hazards and are equipped with the necessary knowledge to make the welding department one hundred per cent proof against accidents.

Better Production Justifies Care of Apparatus

The basic reason for using oxy-acetylene or electric welding in any industry is, of course, an economic one. The welding processes today have been in many industries—and are rapidly becoming so in many more—as much of a production tool item as drill presses, planers, shapers, milling machines and all of the other plant machinery. Compared with other machinery the cost of welding equipment is not cheap if one considers the weight involved. Therefore the getting of maximum results as far as speed and quality are concerned becomes a major reason for the upkeep of welding equipment.

The machine shop tools used in production are bought with great care and maintenance men are employed to keep the machinery in full time and most efficient operation. The manufacturer using welding as a unit in his production will do well to make a survey of the efficiency of his welding equipment.

Inspection of Regulators

First of all, regular regulator inspection should be insisted upon, as the regulator is made up of many parts and small leaks prove to be very expensive over a period of time. Hose, after being in service a while, becomes porous and the loss caused through leaky hose can become a real factor in monthly gas consumption. In addition to this, leaks, especially in the acetylene line, can become a fire hazard. The welding hose and regulators should be turned in regularly to the stock room or to the welding foreman and checked for leakage.

Watch the Torch Tips

Years ago an old school teacher insisted that we keep our pencils sharp and used the old saying, "You can tell a good mechanic by his tools." A carpenter's chisels, saws and plane must necessarily be sharp. In the machine shop cutting tools are ground and reground so that their cutting edges are kept up to a point that insures maximum cuts. The oxy-acetylene welding torch is, after all said and done, a tool. The tip might well be compared to the cutting tools used on other machinery as the tip is, we might say, what governs the size and kind of flame produced. The condition of the tip must necessarily reflect the kind of flame that is produced.

Tips are usually made of brass, bronze or copper and these soft metals are very easily marred, bent or deformed if a careless operator allows the tip to come in constant contact with fire bricks or the metal that he is welding. The orifice of the tip can collect dirt both from the hose carrying gasses to the tip and by the sparking that occurs during welding. The full round cone of the neutral flame can be maintained at maximum efficiency only by keeping the orifice in the tip clean enough to allow the gas to pass through it unobstructed. Tips should constantly be inspected and where the condition of the tip shows it to be worn either through use or abuse so that it is no longer efficient it should be discarded and a new tip installed.

Welders who abuse tips should be corrected. Welders who use pliers and wrenches on the brass fittings of welding apparatus should be corrected. Oxy-acetylene apparatus from regulator to tip is sensitive equipment compared to ordinary shop machinery. For that reason constant inspection to guard against misuse and keep the apparatus in A-1 condition is not only highly desirable but should be considered necessary.

Upkeep of Arc Welding Equipment

With electric arc welding equipment supervision should be maintained so that either the plant electrician or the welder himself is held responsible for clean commutators, brush adjustments to avoid sparking, and greasing for bearing protection. The cables should be inspected regularly and where breaks occur in the insulation, tape should be immediately applied.

From the standpoint of arc welding the electrode holder is a very important tool. The nearer perfect the contact is between the electrode and holder, the less resistance naturally, and the better the weld and coolness in the grip for the operator. The electrode holder like the oxy-acetylene torch suffers through the intense heat and sparking of the metal being welded, and rapidly accumulates a coating of oxide. The welding foreman should see that the electric arc welding operator cleans off the accumulation which gathers on his holder frequently and that the grip surface of his electrode holder grips the electrode in such a way as to insure perfect contact.

Goggles and Helmets

Another thing that is very important in welding, both oxy-acetylene and electric, is the cleanliness of the clear protective glasses used in goggles, helmets and hand shields. In the final analysis all manual welds are the direct result of reaction as sensed by the operator. These reactions must

necessarily come through vision. Consequently a liberal supply of clear protective glasses is very necessary so that the operator can at any time change a dirty glass for a clean one. This gives him the highest amount of visibility and welds will show improvement in proportion to visibility.

In conclusion let me say that if you are a manufacturer or a welding operator intelligent thought as to the care of all your welding equipment will prove to you that results obtained through properly kept up welding equipment is well worth while.

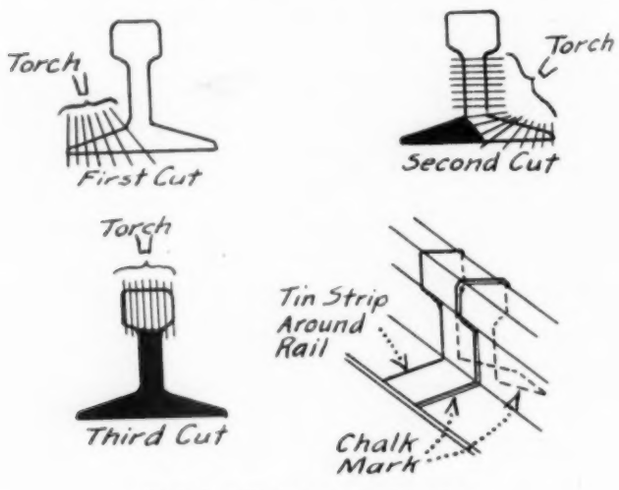
CUTTING RAILROAD RAILS OFF SQUARE

By Joe O'Brien

I was recently called on to cut the steel rail for a railroad company who was relaying a switch yard with heavy rail, all rail being cut to fit on the job, both old and new.

No trouble was experienced in cutting the rail, but I found it was hard to make a square cut owing to the shape of the rail. After marking the rail with chalk and cutting to the chalk line, cut 2 (see sketch) would sometimes miss cut 1 by the width of the cut, making a bad-looking job.

So I took a piece of tin about 4 in. wide and long enough to go around the rail, one long side being straight and the



Method of Marking and Cutting Rails.

ends squared. By placing this around the rail to be cut and drawing a line along the straight side, a cut can be made that is hard to tell from a mill-sawed job. I find it also a big time saver.

ACETYLENE FLAME CLEANS BRAKE BAND

A midwestern concern operating a chain of brake-band repair stations has found that a small acetylene torch using dissolved acetylene supplied from a standard 100-cu. ft. acetylene cylinder is ideal equipment for burning grease from automobile brake bands. As a convenient carrier, this concern has designed a small two-wheeled truck of ox-welded construction which accommodates one cylinder of dissolved acetylene. The entire outfit is simplicity itself. A regulator to control the flow of gas; a short length of hose, and a small acetylene torch complete the outfit. The acetylene torch used for this purpose is the type used by telephone linemen in their daily work.

An evenly timed passage of the flame quickly removes grease and dirt from bands no matter how badly clogged with grease and grit. The entire operation takes but a few minutes and does not harm the metal or the band in any way. This outfit has also been found useful by this concern for relieving frozen brakes and for a multitude of other minor repair applications about the shop.

In removing the grease from a brake band, an ordinary shop vise holds the band in place and permits a thorough cleaning from all angles.

Each station in the chain operated by this company is equipped with one of these acetylene outfits.

Precautions must be taken in using this apparatus not to apply the flame to parts of the car which might ignite. The same amount of care should be employed as in the case of straightening chassis by the oxy-acetylene flame.—*Oxy-Acetylene Tips.*

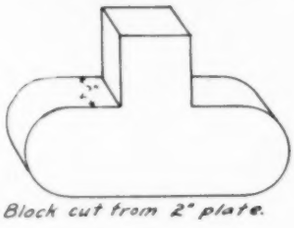
WHEEL-PULLER MADE FROM SHAPES CUT BY THE MECHANICAL TORCH

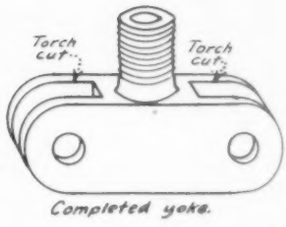
The photographic illustration is that of a device for pulling wheels and gears from printing presses, and was constructed for a lithographing plant by the Mechanical Engineering Products Co., Inc., 1542 W. Jackson Blvd., Chicago, Ill. By employing the mechanical gas cutting torch, considerable expense and time were saved over the use of forgings. The two tongs were cut to shape out a 1-in. steel plate, and holes drilled in them to receive the pins that connect them with the yoke.

The yoke itself was cut from a 2-in. plate, as shown in the drawings, the cut piece being of T-shape, with slots also

(*Left*) Wheel-Puller Assembled From Torch-Cut Parts.

(*Below*) Views of Yoke Before and After Slotting, Drilling, and Threading.





gas cut in each of the opposite arms. The middle arm was threaded to receive a large nut and then drilled through the center for the insertion of a bolt, the nut and bolt being shown in the photograph. The cut surfaces were smooth enough that they did not require any machining.

SAFETY HINTS FOR ELECTRIC WELDERS

In the September, 1930, issue of *National Safety News* are two safety suggestions which will be found interesting to those in charge of electric arc welding operations. One of these mentions the fact that in a large industrial plant an overhead traveling crane is continually passing over the space occupied by electric welders. The safety and comfort of the operator of the crane have been greatly increased by protecting him with colored glass shields set up on three sides of the cab. The color in the glass is not strong enough to interfere with the safe operation of the crane, but it serves to filter out the injurious radiations from the arc.

Another safety hint consisted in placing the plug-in boxes for 440-volt lines for electric welders in locations about two feet above the reach of the average man so that it is necessary to use a small stepladder or stool in order to reach them, thus reducing the liability of their being touched by men who have nothing to do with the welding operations. The main cable to the plug-in box is securely fastened to the wall or post on which the plug-in is located so as to keep the entire line above the heads of all workmen.

WELDING FOR FISH PACKING INDUSTRY

The accompanying photographs illustrate one use which the Hasty Welding Works of San Diego, Calif., is making of welding. The pictures show welded equipment used in the cooking of fish for packing in the various packing plants in San Diego.

The packing of fish and sea products is one of the largest industries in southern California, tuna being the most common kind of fish caught for commercial packing.

Fig. 1 shows a frame (all electric welded) or rack which, in use, is placed on rollers and pushed into the welded steam oven shown in the exterior oven view in Fig. 2. These racks, as well as the ovens, are all arc welded, and are said to be the first so constructed on the Pacific coast. The cookers are constructed of ¼-in. boiler plate.

Some idea of the capacity of these ovens can be obtained when one realizes that each of the four ovens shown in the

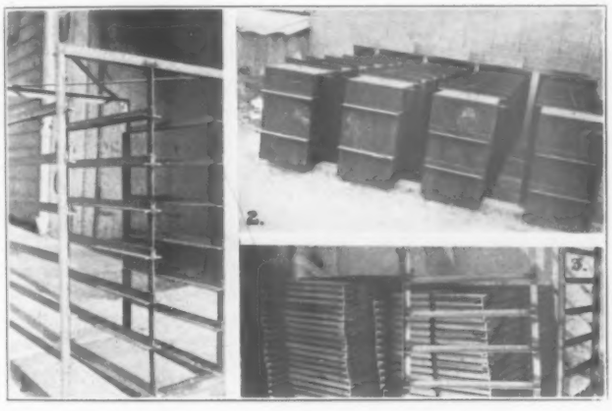


Fig. 1. Welded Racks for Holding Trays of Fish in Process of Cooling for Packing. These Frames Are Placed on Rollers and the Entire Rack Pushed Into the Ovens.

Fig. 2. Section of Fish Cookers, Built of ¼-In. Boiler Plate Electric Welded.

Fig. 3. Piles of Unfinished Sections of Fish Racks, Part of a 10-Ton Contract.

picture holds nine of the racks shown in Fig. 1, and each rack carries about nine hundred pounds of fish. Cooking requires a temperature of 220 deg. F., or about 5-lb. pressure.

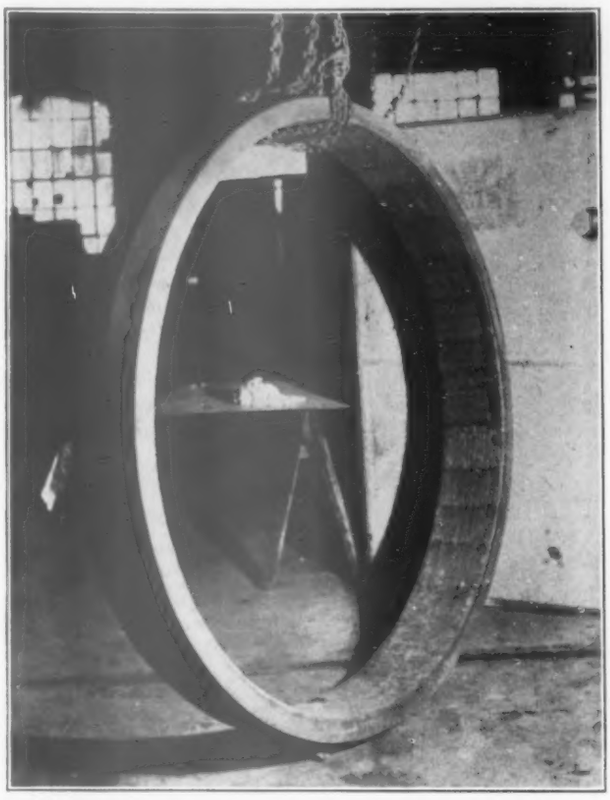
Mr. Hasty recently completed the welding of the four cookers shown in the accompanying photograph, which were for The Westgate Sea Products Co., of San Diego. He has also recently completed for other local companies, 35 tons of these welded cookers, and is now working on a contract for ten tons of the welded racks as shown by the piles of partly constructed sections in Fig. 3.

STOODY PRIZE CONTEST PRODUCES INTERESTING PHOTOGRAPHS

During the past few months, the Stoody Company, Whittier, Calif., has been receiving photographs submitted in a prize competition which closed on September 1st. A total of $500 in cash prizes was offered covering four groups, and the competition in all groups was noticeably keen.

The first group in the contest was the hard facing group, a prize of $100 being offered for the best picture of any welded hard facing job, with an additional prize of $25 for the second best picture on this subject.

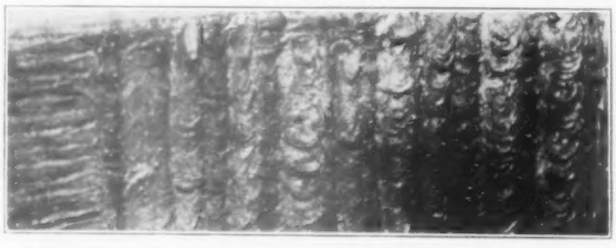
The first prize in this group was awarded to Chester L. Wright, who is in charge of welding at the Dewey Portland Cement Company, Dewey, Okla. He furnished two photographs of the welding on a cement mill die ring. This ring



First Prize Photograph—Welded Cement-Mill Die Ring.

is nine inches wide and about seventeen feet in circumference. Before any welding had been done on it, it was in a badly worn condition. It was first restored to its proper size of welding on about 150 lb. of high carbon welding rod on the inner wall. Then Stoodite was applied over the high carbon deposit.

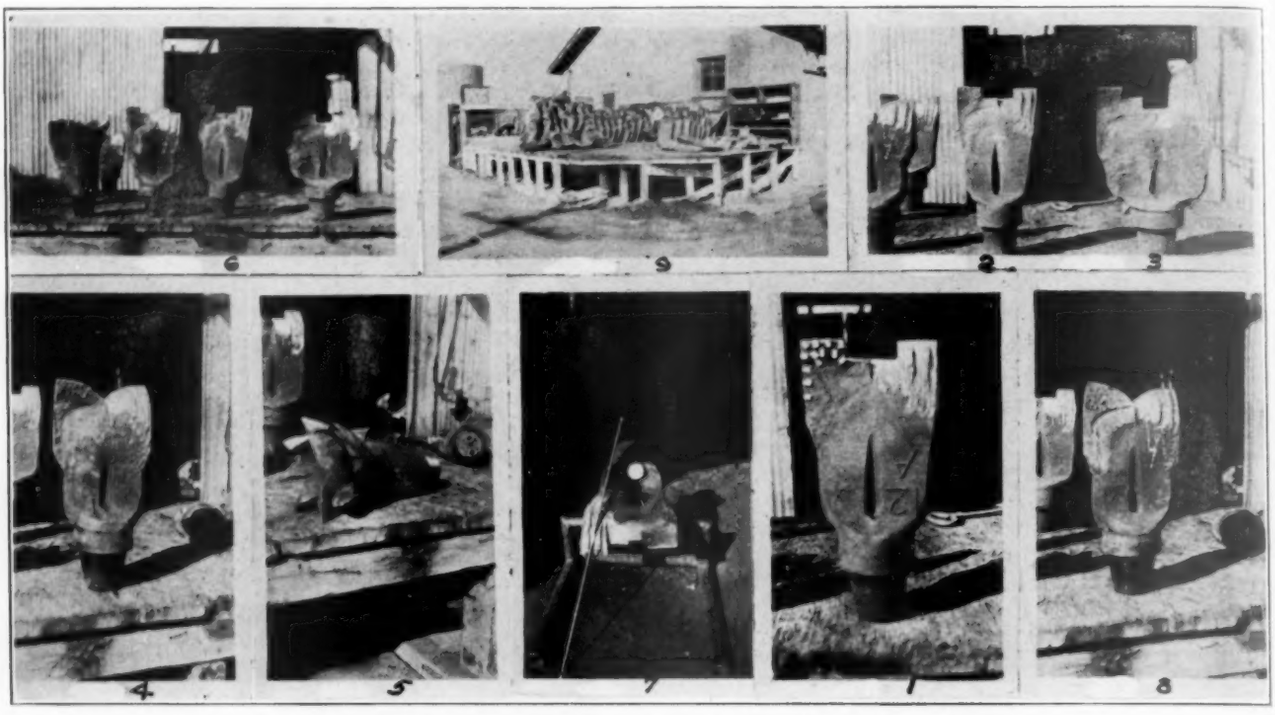
It is stated that in this particular plant, the ordinary die ring is good for only about 600 hours of service, but



Close-Up View of Weld Deposit on Cement-Mill Die Ring.

having been worn down to the point where it is no longer serviceable, and built up as shown in the photographs, this ring withstood more than 3,000 hours of continuous service.

The second prize in this first group was awarded to C. W. Rehback of Whittier, Calif., who submitted the nine photographs shown of various applications of hard facing materials. No. 1 shows Borium set in a 12-inch bit. No. 2 shows a bit set with Borium, and No. 3 a bit set with Borium and faced with Borod. No. 4 is a bit which has been faced, using Borium tube 7/32x1/8 and tube 20-30. No. 5 is a hole straightener faced with 20-30 rod. No. 6 is a group of bits



Second Prize Photographs—Applications of Hard-Facing Materials on Drilling Bits.

which have received hard facing treatment. No. 7 is a bit completed and ready for work. No. 8 is a bit which has been set with Borium and faced with Stoodite. No. 9 is another group of complete tools.

No grinding has been done on the tools shown in this group of photographs. Where Stoodite facing has been used, it has been wiped to size, and where the 20-30 tube facing has been used, it was hammered to size. The bit shown in photograph No. 7 has been completed by hammering it to a knife edge. This work was done in the shop of the Union Oil Company at Santa Fe Springs.

NEW HARD METAL ON MARKET

The Superior Alloys Corp., Ltd., of Los Nietos, Calif., are placing on the market hard metal products known under the trade names of Superior Hard Metal and Superior Compound. This hard metal is a tungsten-carbon alloy, containing approximately 3.7% carbon.

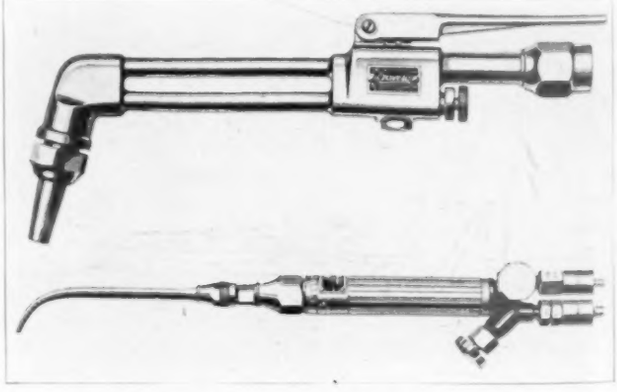
Tungsten-carbon alloys and other "ultra hard" materials based essentially on tungsten carbide, have come into extensive use in the past five years. Superior Hard Metal is made in different sizes, the size most commonly used being .015 cu. in. These inserts will not melt in the hottest part of an oxy-acetylene flame, and may be applied either by electric or acetylene welding. Because of its purity and the close density of its grain, the manufacturers state that it will not burst or crack when the welding heat is suddenly applied. Its hardness is comparable to that of very hard steel. It cannot be softened by any kind of heat treatment, and can be fused electrically only at a temperature of 3,400 deg. Centigrade. It is insoluble in any single acid, and it cannot be machined or even ground by ordinary methods.

Superior Compound consists of small irregular shaped pieces of metal worked between 15 and 30 mesh screens and enclosed in a mild steel tube ⅜ in. inside diameter by 21 in. long. Each tube contains one-half pound of the hard metal. In tube form it is easily applied by the oxy-acetylene process, and is particularly recommended for core bits, reamer and underreamer cutters, discs, etc., in oil well drilling. It may be economically used alone or in combination with inserts thus used as a hard facing metal.

NEW BLOWPIPE ATTACHMENTS

The Oxweld Acetylene Co., 30 East 42nd St., New York City, recently introduced new accessories for the type W-17 welding blowpipe, introduced during the past winter, which now make this blowpipe capable of doing almost any type of work that may be required of an oxy-acetylene blowpipe.

The type CW-17 cutting attachment represents a radical development and enables the blowpipe to do a reasonably wide range of cutting work. It will be noted that a long handle is used for operating the cutting oxygen valve. When this handle is not in use, it can be pulled forward parallel to the tubes so that the whole attachment may be carried around in the operator's pocket. The attachment has the same style of stem lock nut as the welding head for the type W-17 blowpipe. The injector for the heating flames is contained in the attachment, just as the injectors are contained in the welding heads. At the rear of the attachment near



(*Top*) Oxweld CW-17 Cutting Attachment in Operating Position.
(*Bottom*) Blowpipe Handle With Adapter and W-15 Welding Head.

the bottom is an adjusting screw, so that the oxygen for the heating flames may be regulated by the operator's thumb and forefinger while the blowpipe is in operation. The attachment is joined to the blowpipe handle in exactly the same manner as a welding head—that is, the lock nut can be

tightened by hand and no wrench is necessary to join the attachment to the handle. The attachment is supplied with two cutting nozzles.

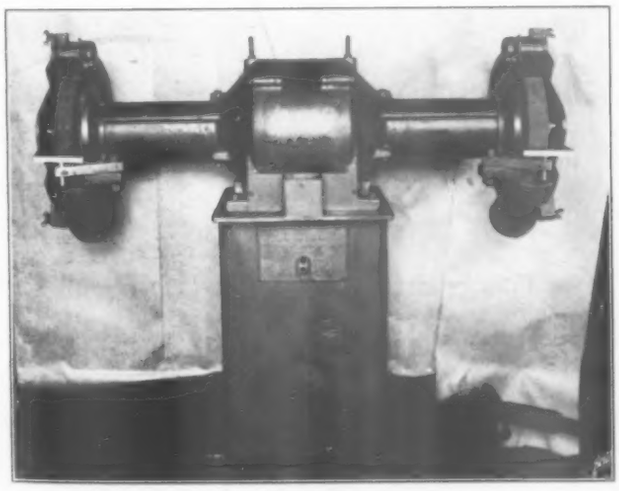
Another accessory which has just been introduced for use with the W-17 welding blowpipe is the W-17 to W-15 adaptor which makes it possible to use any of the welding heads available for the Oxweld W-15 sheet-metal welding blowpipe with the type W-17 welding blowpipe handle. This means that the W-17 welding blowpipe may be used on work ranging from the lightest type of welding to the heavy general welding work required of such equipment. The end of the adaptor, which fits onto the W-17 blowpipe handle, is similar to the rear end of a W-17 welding head. The adaptor contains passages for the oxygen and acetylene which fit tightly against the pasasges in the blowpipe handle. The other end of the adaptor is exactly the same as the end of a W-15 sheet-metal blowpipe handle, so that no more adjustment is required in attaching the W-15 welding head to the adaptor than to a W-15 handle.

WELDED GRINDER WITH EXTENDED ARM

A heavy-duty-type extended-spindle grinding machine is the latest addition to the "One Profit" line of machines put out by the Production Equipment Co., of Cleveland, Ohio. The strength and rigidity of this machine are featured by the manufacturer, who points out that these characteristics have been made possible, and at the same time useless weight eliminated, by constructing the base and accessories of this machine of welded steel shapes.

The operating motors were designed and built in the company's own plant. These motors require no ventilation and are completely enclosed, thus positively preventing dirt, dust, grit, or any other foreign substance from entering. They are said to operate well within the A.I.E.E. temperature limitations.

Four heavy-duty ball bearings, two in each extended arm, provide strength and rigidity to the extra-heavy nickel



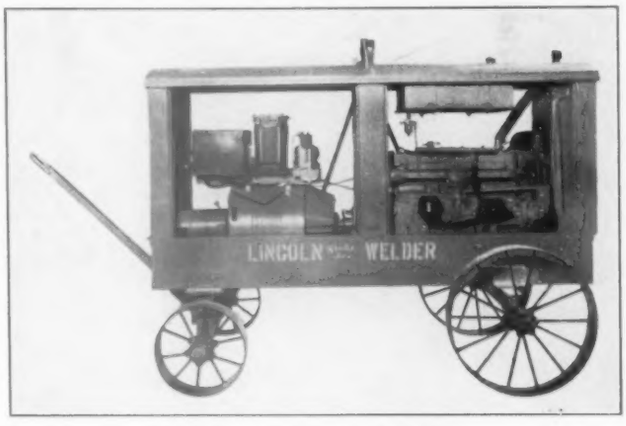
Grinder for Bulky and Odd-Shaped Material.

spindles. The grinder illustrated is particularly adapted for grinding bulky or clumsy material, such as automobile bumpers, heavy castings, or long and irregular-shaped castings or parts. Bulletins giving complete details of the mechanical construction may be secured from the manufacturer.

ANNOUNCES NEW 400-AMP. WELDER

A new gas engine-driven welder rated at 400 amp. was recently put on the market by The Lincoln Electric Company, Cleveland, Ohio. The growing use of larger-sized electrodes led to the development of this larger machine, which is designed for field work in all kinds of construction work, such as structural, oil and gas lines, field repairs, ship repairs, ship building, etc.

This 400-amp. machine has a current range up to 500 amp. and is of the variable-voltage, single-operator type, operating at 1,500 r.p.m. The working mechanism of all controls are contained in a ventilated enclosed steel cabinet with hand regulators and switches mounted on a panel which forms a side of the cabinet. The control panel contains rheostat, diverter switch, volt-ammeter, and wing-nut terminals for cables. This unified control greatly increases the simplicity of the operation of the welder. The control cabinet is mounted directly over the generator for easy access by the welding operator. The commutators of both



Gas-Driven Unit for Field Welding.

the welding generator and exciter are provided with covers or protection and also to prevent anything falling on and injuring the commutators.

This unit is driven by a six-cylinder engine with an S.A.E. rating of 33.75 and 55 brake hp. at 1,500 r.p.m. The outfit is equipped with an automatic throttle control which permits the engine to idle at about half speed when the arc is not going. When the arc is struck the engine immediately comes up to full speed. By means of a time relay, the engine keeps going at full speed when the arc is momentarily broken and will not slow down for a predetermined time interval after breaking the arc. This permits the operator to change electrodes, etc., without affecting the speed. However, it is necessary for the operator to change positions, etc., the slow-down occurs. The effect of this throttle device is a saving in upkeep and also of gasoline consumption.

Wheels are optional. When furnished, they are of 6-in.-width tread and a fifth wheel is provided for short turning. The overall dimensions, exclusive of wheels, are 104x32x58 in., and the weight is approximately 3,500 lb.

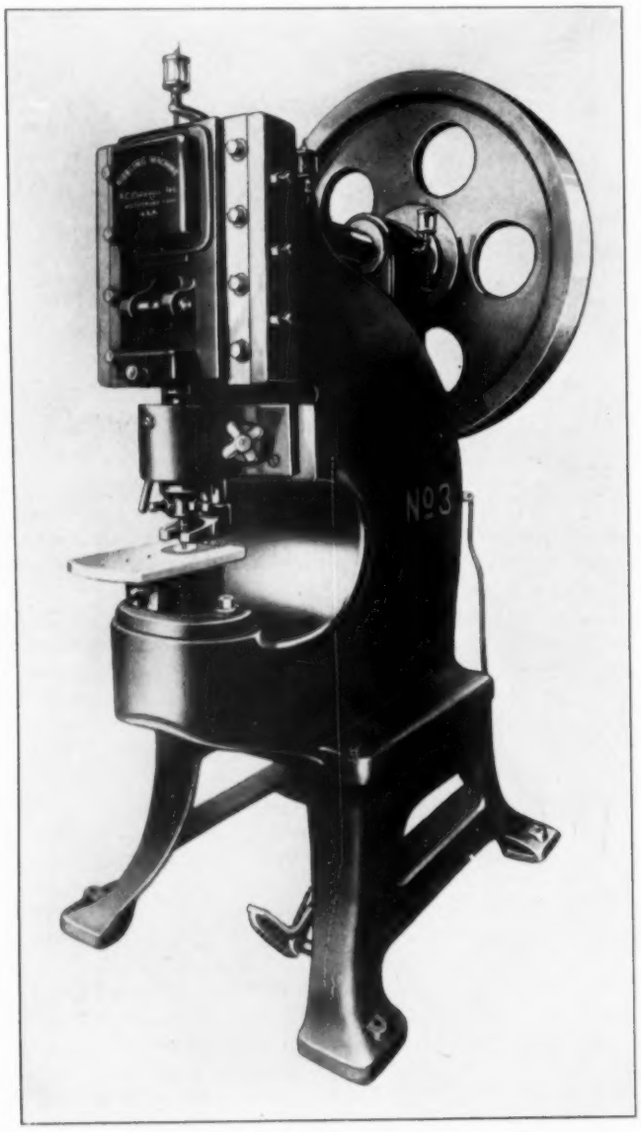
NEW NIBBLING MACHINE FOR CUTTING OUT METAL PARTS

Many manufacturers are using nibbling machines for cutting parts out of steel plate for welding, as in some cases this is found to be the cheapest and most convenient method of making such shapes. The Campbell No. 3 nibbling machine, shown in the illustration, fulfills the need of a machine for cutting any kind of shape from sheet metal of ⅜-in. or ¼-in. or intermediate thickness. This machine cuts fast in any direction—approximately 20 linear inches per minute. Like the smaller machines, it works on the circular punch and die principle with a pilot to prevent the work from slipping and the punch from taking too large bites. The cutting is clean without burr, and very little finishing is necessary when an absolutely smooth edge is required.

The machine will handle a large variety of work. Circles can be accurately and easily cut with the circle cutting attachment furnished with the machine. For making original

cuts, the use of a straight-edge and a French curve is recommended, as this insures close cutting to the line even by the inexperienced operator. The original piece may be used as a templet for cutting duplicate pieces. The punch follows the templet accurately. The punch diameter is ⅞-in.

The machine is very rigid in construction and has a large factor of safety, and it does not unduly tire the operator. It has three strokes—1, 13/16, and ½ in. The punch can be quickly set in the die by turning the stroke-adjustment collar. The stripper plate is set into its correct position by releasing the locking lever and turning the handwheel.



Nibbling Machine for Cutting Out Shapes From Sheet Metal.

The floor space required, without the driving motor, is 5 ft. 0 in. by 4 ft. 2 in., and the height over the wheel is 8 ft. 6 in. The depth of the throat is 15 in. The power required is 7½ hp. The shipping weight of the belt-drive machine is 9,500 lb.

Further information regarding this machine can be obtained from the manufacturer, Andrew Campbell, Inc., Bridgeport, Conn.

NEW "FEDERAL" SEAM WELDERS

A new standard line of seam welders, built in transformer capacities from 50 to 150 kw. and with 16-point regulation through a separate regulating coil, has been announced by The Federal Machine & Welder Co., Warren, Ohio, who at the same time announces the addition of a line of light-duty welders made in throat depths of 6 to 12 in. and transformer capacities of 5 and 7½ kw.

The larger-capacity welders, first mentioned, have operating speeds of 10 to 30 ft. per min. on 16- to 24-gage material, and throat depths of 24 to 48 in. One of the several novel features is the supplying of pressure by air through a toggle device with easily accessible and readily adjustable spring control. All current-carrying parts are water cooled. No magnetic material is used in or near the welding rolls, and either or both rolls can be driven, according to the requirements of the work. The equipment may be operated either on straight-through or end seaming.

The light-duty welders can be used on very light material up to two pieces of ⅛-in. stock. A 6-point heat regulator is provided. The base or pedestal is constructed of pressed metal parts, giving a very rugged construction and yet lightness in weight; the manufacturer states that this is the first time this kind of construction has been used in a resistance welder.

OXWELD NO. 23 ALUMINUM ROD

The Oxweld Acetylene Co., 30 East 42nd St., New York, has introduced a new welding rod, designated Oxweld No. 23 Aluminum Rod, which is recommended for welding either aluminum sheet or castings when the metal is tightly held in jigs and is not free to move.

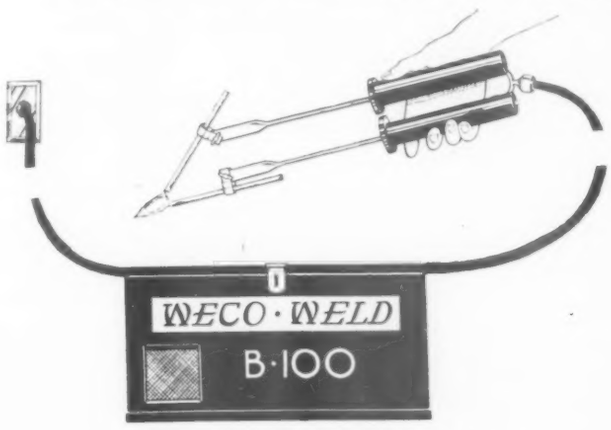
At temperatures just below their melting point, aluminum casting alloys possess very little strength and have a high contraction coefficient. The combined effect of these two properties may under certain conditions cause cracks to occur adjacent to welds. The new welding rod is recommended for welding these alloys because of the fact that its melting point is lower than that of the metal being welded, so that it will remain in the molten state after the base metal has solidified. The weld metal will therefore fill in any voids that may have been created by the solidification and contraction of the base metal. Any stresses which might be caused by contraction will shift their effect from the base metal to the weld metal which, being free from hot shortness, will absorb the stresses without the development of cracks. Oxweld No. 23 Aluminum Welding Rod coalesces readily with all of the aluminum alloys and possesses high strength and good corrosion resistance. It is now available in three sizes—$\frac{1}{16}$, ⅛, and ¼ in.

ELECTRIC TORCH FOR BRAZING

The Warner Engineering Corp., Pomona, Calif., recently announced an interesting device called the "Weco-weld." This outfit is primarily intended for brazing purposes. It consists of a mechanism for adapting the ordinary 110 volt, alternating current by means of a reactor coil. This can be connected to any light socket on a 110 volt, 50 or 60 cycle, a.c. line. The current is taken through flexible leads to the torch which operates on the principle of the carbon arc. The two carbons shown in the illustration are separated when the machine is not in use. A tightening grip on the torch handle brings the carbons together and closes the circuit. Then they are allowed to separate slightly and the arc is formed. The heat is varied by changing the plug on the line from the handle from one receptacle to the other, or by varying the distance between the arc and the work, or by varying the distance between electrodes. The joint is first cleaned, then heated by the arc, and a small amount of flux is applied. The brazing rod is then held near the arc while the work is being heated, and when it becomes heated, it is dipped in the flux. The rod is applied to the work when the latter is hot enough to melt the brass. The weight of the entire machine is 33 lb., permitting it to be carried or placed in any part of the factory or shop. The

torch handle, when not in use, fits conveniently into the box. The machine retails at $42.50, and is said to cost about 12c per hour to operate. It is reported that tests made in California showed the power cost to be about 9c an hour, while the carbons, which cost 11c each, lasted approximately 18 burning hours.

This machine is intended for brazing of light work, and

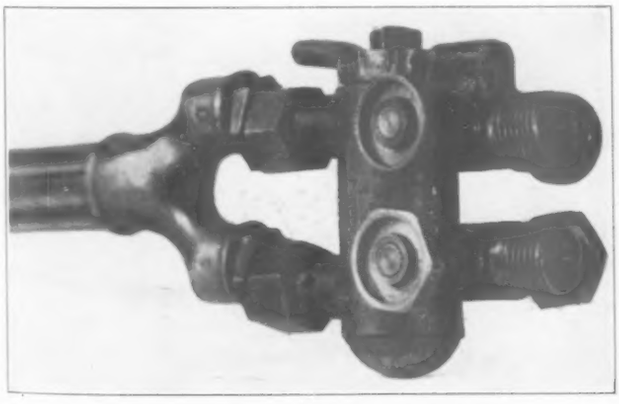


Brazing Torch That Operates From Light Socket.

it is stated that it will handle material up to ¼ in. thickness. It is also stated that the heat may be concentrated sufficiently to allow cutting very light materials, and will permit metal as thick as ½ in. to be heated sufficiently to permit bending.

"SPEED VALVE"—A NEW GAS CONTROL

The Y & M Speed Valve Company, Compton, California, are placing on the market a new device which is called the Y & M Speed Valve. The valves are designed to be attached to welding and cutting torches for the automatic control of the gas mixture. In operation an instantaneous change from a preheating flame to a soft welding flame is obtained by a slight movement of the control lever. The master valve controls the mixtures so that the operator can go from one



New Type of Automatic Valve for Torches.

type of flame to another with one quick motion. The valve does not need to be removed from the welding torch if the welding head is removed and a cutting head inserted. The valves are made in two sizes called the Junior and Senior. The Junior valve is placed on the torch by attaching directly to the needle valve. The Senior valve is placed on the torch by removing the needle valves and placing the speed valve on the body Y. Manufacturers claim marked savings in both time and gas with torches equipped with these control valves.

HARRIS CALORIFIC ANNOUNCES COMPLETE LINE OF LOW-PRESSURE EQUIPMENT

The Harris Calorific Co., Cleveland, Ohio, have just put on the market a complete, new line of oxy-acetylene welding and cutting equipment to operate on the low pressure principle. This organization, which has been in business since 1905, has shown marked initiative in the past in the development of such items as automatic torches, gasavers, multi-stage regulators and line regulators, and has done a thorough job of producing a low pressure line.

The first item featured in the literature describing the new line of apparatus is the Harris "Red Head" Model 6 portable automatic acetylene generator. This generator is designed for low pressure acetylene generation and does not make use of gauges or motors. The three principal parts are the large tank, the generating cone, and the hopper. These are all simple in construction, interchangeable,

Harris No. 6 "Red Head" Acetylene Generator.

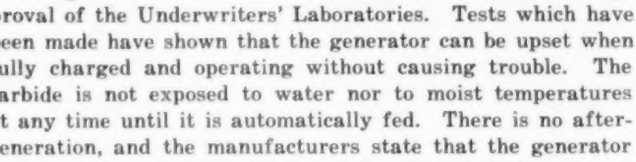
and strongly made. The base of the main tank is 17½ in. in diameter. The net weight is 53 lb., and the weight fully charged is 238 lb. The generator uses rice carbide and takes 20 lb. of carbide at one charge.

Referring to the illustration, the working principle of this new generator is as follows: The gas pressure, which is generated when carbide strikes the water, forces the water down inside of the cone up on the outside to a pre-determined level, at which point the diaphragm automatically shuts off the carbide feed until the acetylene is withdrawn from the generating chamber by way of the flash-back check. On its way out of the generator, the acetylene is washed, screened and dried, so that a dry gas free from impurities will be delivered to the torch. The manufacturers state in this connection that the operation is such as to produce water circulation in four directions—up and down, horizontal, and in a circular direction, and that this circulation of the water prevents the accumulation of hot water at the top and assures the cool generation of acetylene.

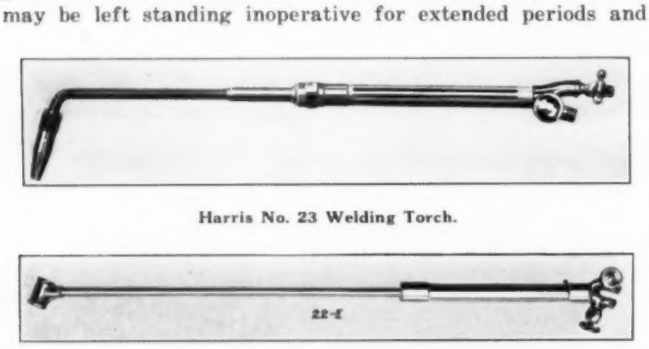
Due to the simplicity of construction, it is pointed out that it is a very simple matter to dismantle the generator to make it easy to transport it to comparatively long distances, the reassembling and starting of the generator being a matter of only a negligible amount of time. For short

carries, it is readily portable by two men or by one man on a special ball bearing truck which has been developed to accommodate it.

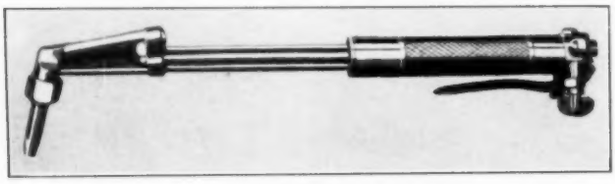
The generator has been tested and has received the approval of the Underwriters' Laboratories. Tests which have been made have shown that the generator can be upset when fully charged and operating without causing trouble. The carbide is not exposed to water nor to moist temperatures at any time until it is automatically fed. There is no after-generation, and the manufacturers state that the generator may be left standing inoperative for extended periods and



Harris No. 23 Welding Torch.



Harris No. 22 Welding Blowpipe.



Harris No. 62 Cutting Torch.

will instantly respond the moment it is called upon for operation. It has been subjected to actual field working conditions with temperatures varying from 32 deg. below freezing up to 100 deg. F.

This new Harris Red Head generator is priced at $50.00, completely crated, f.o.b. Cleveland. The weight crated is 72 lb.

For operation in connection with their new generator, the Harris Calorific Company has developed several new types of welding and cutting torches. They feature especially the welding torch No. 23. This is a low pressure welding torch, having an injector, and it is stated that it is of the strictly non-flash type, capable of withstanding all of the tests featured in balanced pressure or high pressure welding equipment. Welding tip assemblies for the No. 23 torch are offered in ten different sizes, each size proportioned in relation to the flame and the distance of the tip from the operator's hand. The handle of the torch is deeply grooved and of small diameter to facilitate manipulation by the operator. The valves are located so that they may be easily controlled by the torch hand of the user. The torch can be operated with compressed acetylene from cylinders if desired. As an accessory to this torch, a special cutting head has been produced. When assembled with the No. 23 handle, this cutting head is said to permit a cutting range up to 5 in. in thickness. The cutting head is also constructed on the low pressure principle.

Another complete new series is designated as the welding blowpipe No. 22. This is made in five sizes ranging from 14 to 35 in. in length. The handle, instead of being round, is made up of a series of flat sides. The manufacturers state that this series is fairly free from back-fire. In order to provide an inexpensive means for doing occasional light cutting, a special cutting head has been produced for use with the No. 22 blowpipe so that in order to change from welding to cutting, it is necesary only to remove the welding head and introduce the cutting head.

For continuous cutting with low-pressure acetylene, there has been produced the Harris cutting torch No. 62, which is built on the injector principle, and the manufacturers claim that it will operate under the most severe conditions without back-firing. The three gas tubes are of a special nickel alloy, and, as shown in the illustration, are arranged in a triangular construction. This is for the purpose of obtaining maximum strength with the least weight. The high pressure oxygen control is a long lever so adjusted as to give the operator easy control over the flow of oxygen. Tips for this torch are of the one-piece copper type, drilled so that the heating flames are impinged at the end to concentrate the preheating flame. Special tips are provided for cutting with gases other than acetylene.

Other items included in the new line are a small torch designed primarily for sheet metal work, a lead burning torch, a low pressure hydraulic back pressure valve, and a special ball-bearing truck, designed to carry a No. 6 Red Head generator and an oxygen cylinder.

These new items are illustrated and described in detail in a recently published supplement to the Harris catalogue. In introducing the new line, the manufacturers point out that this equipment is the result of a number of years' extensive experiments and research work on the part of Harris engineers, who are exclusively engaged in the manufacture of gas welding and cutting equipment. The new line is not intended to displace the former Harris models, which will be continued.

NEW SAFETY GAS LIGHTERS

The Amico Novelty Corp., 40 West 43rd St., New York City, has placed on the market a new automatic pistol gas lighter, "Nerfail," to meet the demand for a durably constructed gas-lighter at a low price. The lighter is made of heavy metal, nickel-plated, highly polished, and is of strong construction. The makers state that the spring will not break or get out of order, and the trigger will release readily and that the file is made of glass-hard steel and will last for years. "Nerfail" is packed in an individual box, twelve to a carton.

Amico Novelty Corp. has also placed on the market several other gas lighters for welders, households, shops, etc. The "Circofile" lighter, a round file type, is made of strong pliable

New Automatic Pistol-Type Gas Lighter.

metal and can be operated without difficulty; the spark tip can be changed whenever necessary by merely unscrewing the old tip and screwing on the new one; the lighters are packed in an attractive display container holding one dozen lighters. A new catalog describing various lighter items is now available, and may be had upon application.

OXWELD TWO-STAGE OXYGEN REGULATOR

A constant line presure free from any fluctuation is most desirable for good results in gas welding. The Oxweld Type R-43 Oxygen Welding Regulator, recently introduced by Oxweld Acetylene Company, 30 East 42nd St., New York, prevents fluctuation by means of a system of two-stage pressure reduction. This two-stage reduction is accomplished

through two separate and independent sets of diaphragms, valves and springs. The full cylinder pressure of 2,000 lb. enters the regulator through a stem-type valve and is controlled by the first stage diaphragm. In this stage the pressure is reduced to less than 250 lb. per sq. in. This pressure will be constant for any one regulator, but varies somewhat with different regulators. The pressure here is non-adjustable.

The oxygen then passes from this first reduction assembly to a second stem-type valve and diaphragm assembly where the pressure is reduced to the working pressure desired by the operator. This pressure is regulated by the operator by means of the adjusting screw, and any operating pressure may be obtained without fluctuation.

The external appearance of the Type R-45 regulator is shown in the accompanying illustration. Instead of the usual handle-type pressure adjusting screw found on all other Oxweld regulators, there has been substituted a screw with a ribbed cap. This radical change in external design not only presents a neater and more compact appearance but will also avoid the possibility of breakage as there are no pro-

Oxygen Regulator With New Type of Adjusting Screw.

jections on the handle to be bent accidentally. This new type adjusting screw is of smaller diameter than the body of the regulator itself, so that it is easier to pack for transportation from one job to another.

FLASH WELDER FOR BUTT WELDING PIPE

The recently increased need for steel pipe for gas and gasoline lines from the fields to the distribution centers has created the urgent demand for double-length pipe so as to reduce by 50% the number of costly electric-arc or gas welds that must be made in the field. To make these double-length sections, which are approximately 48 ft. long, comprising two standard lengths of pipe, resistance flash welding has been used to advantage due to the rapidity and low cost involved.

The HP-8 pipe welder, show in Fig. 1, is the latest product of the Taylor-Winfield Corp., of Warren, Ohio, to be designed for this purpose. This welder operates rapidly and permits ready handling of the pipe to and from the welder, thus securing large production.

The operating controls for air, hydraulic pressure, and voltage are located conveniently for the operator's position on top of the welder, where he has complete vision of all the operations, while being out of the way of the movements of the pipe.

The clamping of the current-carrying jaws is accomplished by air cylinders operating through toggles. The jaws are of the equalizing type, which always center both sections of pipe to be welded regardless of manufacturing size variations.

The backup shoes, which hold the pipe against the heavy pressure required to make the final push for upset of the

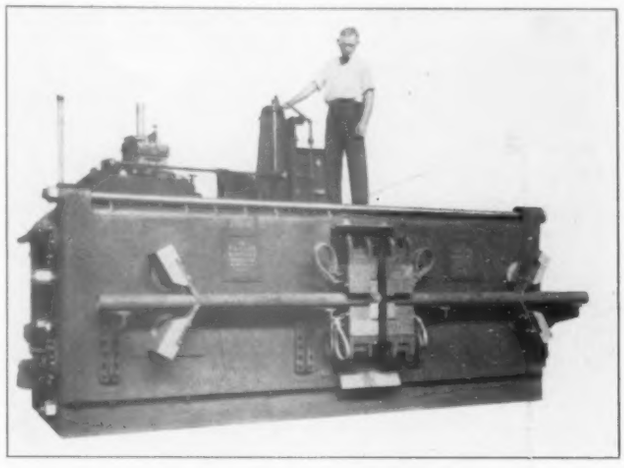


Fig. 1. Flash Welding Pipe End to End.

weld, are hardened tool steel and have suitable teeth to engage the pipe. The heavy rocked shafts that support the shoes are air operated and designed on the principle of a pipe wrench, the greater the pressure the more secure the grip.

A great deal of thought was given to the transformer, which is the "heart" of the welder. It is located close to the

Fig. 2. Showing 4-In. Pipe Crushed After Being Welded by HP-8 Pipe Welder Shown in Fig. 1.

current clamping jaws, insuring high efficiency. The primary coils are entirely enclosed, which protects them from flash and particles of steel that cause burnouts.

Due to the extreme ranges of pipe that can be commercially held and welded in these units (the one illustrated handles pipe from 2 to 10 in. in size), provision also had to be made for a wide range of welding voltages, so a new type of multi-coil transformer with a novel selective switch to give twelve different voltages was devised.

While the transformer has been called the heart, the control device could be named the "brain" of the welder, as it is almost human in its action. The hydraulic pressure for operating the push-up and also the automatic flashing,

is obtained by a motor-driven, constant-pressure pump of the self-contained type. The welding cycle, controlled by a suitable dial valve, can be varied in speed from four seconds to forty seconds as required for the different sizes of pipe, the adjustment being infinitely variable and not by steps as usually furnished.

While the flashing and push-up are fully automatic, they can be stopped or reversed at the will of the operator and a complete cycle started again should for any reason the flashing or preheating be interrupted. This is an exclusive feature of this device.

The upsetting pressure and the length of slide movement can be quickly and readily changed to take care of different sizes and gages of pipe; also the copper dies and backup shoes quickly changed, permitting a rapid or frequent set up when production so demands.

All the parts of the welder are well proportioned and rigid, insuring stability, and will remain properly adjusted under long and severe usage. The heavy box-like castings which form the frame, together with the longitudinal tie rods that go through the full length of the welder, are further supported on structural-steel beams.

The same type of unit can be furnished in three other sizes—1½ to 6 in., 6 to 16 in., and 14 to 24 in.

SELF-PROPELLED WELDING UNIT

A Lincoln Stable-Arc welder, together with all necessary accessories, mounted on a McCormick-Deering tractor, has the advantage of being a self-propelled, self-contained unit, with one power unit for traction and operating the welder. The details of this outfit are given in a folder issued by the manufacturer, the Pontiac Tractor Co., 44-52 W. Lawrence St., Pontiac, Mich. The extension frame of this unit is such that in mounting, the tractor is simply set into a 4-in. I-beam frame, and the axle assembly is set ahead under the frame, thereby lengthening the wheel base. This construction reinforces the tractor and gives it balance, making it easy to steer with the added weight. A draw bar is provided for hauling other equipment. The generator is driven at the proper speed through a belt.

OBTAINING HYDROGEN FROM AMMONIA FOR WELDING

The General Electric Co. announces an equipment for the dissociation of anhydrous ammonia into its component parts of 25% nitrogen and 75% hydrogen, to such a degree as to be suitable for use with atomic hydrogen welding equipment. By the use of this equipment the hydrogen can be obtained very economically.

The dissociator has a maximum capacity capable of supplying enough dissociated gas per hour at atmospheric pressure and temperature, to operate a ⅛-in. electrode holder for current values up to and including 70 amp. The pressure of the gas at delivery does not exceed 10 lb. per sq. in. The electrical rating is 3.5 kw. at 220 volts, 60 cycles.

The ammonia gas is drawn directly from a standard tank of good quality anhydrous ammonia. The tank is so arranged as to discharge gas and not liquid ammonia into the piping. The ammonia tank, if kept at room temperatures, will supply gas at pressures from 100 to 150 lb. per sq. in. at all times until the tank is emptied and ready to be replaced.

The dissociator consists of an electrically and thermally insulated alloy tube filled with an ammonia cracking catalyst and connected to a low-voltage, high-current transformer. Suitable inlet and outlet tubes and openings for temperature indicating and controlling devices are provided. All parts subjected to high temperatures are made of heat-resisting alloys and are welded at all heated joints. Threaded fittings are provided for replacing the catalyst and the thermocouple. Such screwed joints are placed in unheated parts of the dissociator and will not leak at specified pressures in the dissociator.

The equipment is also provided with suitable temperature control and indicating devices, regulator, safety devices, heat interchanger, etc.

In operation a small snap switch is pressed and after about 10 minutes the temperature indicator will show a reading within the operating zone. The ammonia tank valve is then opened and the operator is ready to weld. As soon as the arc is struck the gas will flow and when the arc is broken the gas will stop. When everything is functioning properly the dissociator will need no more attention even though the operator ceases welding for some time. It is not necessary for the operator to start using gas as soon as the operating temperature is reached in the dissociator.

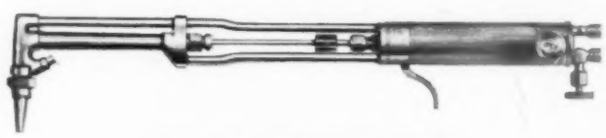
NEW TORCHWELD CUTTING TORCH USES GASOLINE FOR FUEL

The Torchweld Equipment Company, Chicago, Ill., manufacturers of oxy-acetylene welding and cutting equipment, have recently put on the market a new model of cutting torch which uses ordinary gasoline as a fuel instead of any of the commercial gases which have previously been used for cutting. This new torch has been subjected to a number of tests to determine its safety and operating qualities, and is already being used by a number of large industrial plants on cutting operations.

Complete Gasoline Torch Outfit.

In appearance, the gasoline cutting torch does not differ very much from the cutting torch of conventional design, and fundamentally, the cutting operation is the same in that it consists of a preheating of the edge of the material to be cut, followed by the release of the cutting jet of oxygen. One difference in construction between this torch and the cutting torch made to operate with acetylene or other fuel gases is that provision is made for an extra heating flame. This flame comes from a small opening located directly above and in the rear of the cutting tip and directed against the lower tube.

A complete outfit for utilizing the Torchweld gasoline


New Torchweld Gasoline Torch.

cutting torch consists of a welded steel two-gallon gasoline tank with hand pump and pressure gauge and oxygen cylinder with cutting regulator, one length of rubber hose for oxygen, one length of armored flexible hose for gasoline, one cutting torch with tips and one hand truck specially designed for carrying the complete outfit where portability is desired.

The advantages claimed by the manufacturer for the gasoline cutting torch are: The availability of gasoline, which is obtainable practically everywhere; the elimination of handling of heavy fuel gas cylinders; the elimination of the possibility of running short of gas on the job; the savings in storage space; the reduction in bulk and weight of complete equipment; a general reduction in the cost of cutting;

elimination of charges for gas left in cylinders and of cylinder rental charges; and, in particular, the low cost of gasoline as compared to the commercial fuel gases.

The Torchweld gasoline cutting torch is supplied with tips of various sizes to take care of the complete range of common cutting operations.

NEW FLUX AND SOLDER DEVELOPED BY LOTAN

The Lotan Research Corporation of Cleveland, Ohio, have been marketing a cast iron brazing compound consisting of two powders; one of these was for tinning iron castings with bronze and the second was used as a flux for building up the bronze deposit after the tinning layer had been applied. The company has recently announced a new cast iron brazing flux which is claimed to combine the advantages of both powders in one single mixture. It is pointed out that this allows faster work in welding cast iron with bronze. It is also said that the operation is simplified so that it is less difficult for the operator to acquire the necessary skill. Penetration from 1/32 to 3/32 inch in the cast iron by the bronze is claimed when this flux is used.

Another new product of this company is called the Lotan Super-Solder. It is made in paste form, the paste containing only the necessary fluxing material and the solder. Its composition is about 50% lead and about 50% tin. It has a very low melting point and a high tensile strength is claimed for it. This solder may be mixed or alloyed with other metals and the consistency of the paste may be varied at will by adding more or less flux so as to best meet the application from a production point of view. It is said to be non-corrosive under all known conditions and adaptable for soldering all metals except aluminum. It does not deteriorate with time and is not affected by the atmosphere.

The initial fluxing temperature is given at between 180 and 210 degrees F. The initial melting temperature at 260 degrees, the final melting temperature at 268 degrees and the remelting temperature without flux at 336 degrees. This solder can be applied by means of a squirt gun with a brush from tubes or with a stick of convenient size. Direct heat has proven to be the most desirable means of heating, although hot plates, portable irons and ordinary soldering irons can be used whenever desired.

FLUX COATING FOR TUNGSTEN CARBON ALLOYS DEVELOPED BY STOODY

The Stoody Company, Whittier, Calif., are announcing a new development in flux coating of Borium, which is the Stoody tungsten carbide diamond substitute. It is pointed out in the announcement that while tungsten carbide diamond substitutes have made great progress in connection with the fabrication of oil field drilling bits, there has previously been some handicap felt in the actual application of material, and they state that Borium may now be applied speedily, economically and easily, with no special care or preparation, using either the electric arc or the oxy-acetylene torch.

Although both metallic tungsten and tungsten carbide have a relatively high melting point—the melting point of the tungsten carbide being approximately 2800 deg. Centigrade—metallic tungsten oxidizes at relatively low temperatures. Experiments have indicated that tungsten exposed to both heat and atmosphere will start oxidation at approximately 1000 deg. Fahrenheit, and as the heat increases, the yellow oxide of tungsten forms very rapidly. It is this formation of the oxides of tungsten which has in the past necessitated considerable care and considerable preparation in the application of tungsten carbide metallic diamond substitute. The new flux which has been perfected is said to completely protect the Borium while it is being applied, so that even though it is applied with the electric arc, the formation of the oxides of tungsten will be impossible, and the solid metallic Borium will become embedded in a much harder protective matrix than was formerly the case. The flux coated Borium may be obtained in tube form if desired, and in this form the application consists in simply using the tube Borium as the negative electrode of the electric welding arc and melting it down as any mild steel electrode would melt down. When the flux coated pea Borium is used, mild steel rod, high carbon rod or any alloy welding rod may be used as the electrode of the electric welding arc and melted down around, over and about the Borium with no fear of injuring or oxidizing it. Either the pea size or the tube size may be applied equally well with the oxy-acetylene torch.

It is also stated that due to certain chemical properties of the flux coating used, the surrounding matrix is harder and furnishes better protection than that which has formerly been obtained. It is planned to have this new product on display in the Stoody booth at the International Petroleum Exposition which is to be held next month at Tulsa, Okla.

BOOKLET ON AUTOMATIC CONTROL OF GENERATOR VOLTAGE

Non-vibrating types of automatic voltage regulators for both a.c. and d.c. generators are shown and described in a booklet issued by the Marshall Electric Co., of Elkhart, Ind. These devices are extremely simple in construction and operation, which feature will be of particular interest to manufacturers and users of arc-welding generators.

The resistance element of these regulators is a carbon pile, consisting of specially prepared carbon discs, and the resistance is varied by compression of these discs through a lever arm actuated by a magnetic solenoid. The instrument is said to be very sensitive, yet thoroughly reliable in operation. Having but little weight to move and no springs to overcome, it responds quickly to variations in line voltage caused by changing load, variation of speed, or other factors.

A unique feature of these regulators is that the current supplied to the shunt field of the exciter is not pulsating or intermittent but is continuous and of the proper strength required at the moment of load change. Thus a smooth regulation is obtained and no retarding action is necessary. This feature is said to cut down the time interval of exciter-shunt-field change to 3 seconds.

Schematic diagrams and field connections are shown, as well as typical voltage-regulation curves.

NEW WESTINGHOUSE TRAINING MANUAL

Westinghouse Electric & Manufacturing Co. have recently issued a new training manual for electric arc welding operators. This comes in the form of a 24-page booklet, 8½x11 in. in size, with a strong cover. The subject matter is introduced by several pages of general information regarding the arc welding process. The theory of arc welding is described in non-technical language, and explanations are given of the use of both the graphite electrode and the metallic electrode. Exercises are outlined for developing skill in welding in a horizontal plane, in a vertical plane, and overhead. Definitions of words and terms used in welding literature are given, together with illustrations of various types of designs. Instructions for selecting the right size electrode and the right current values are given in tabular form. There is some discussion of the effects of expansion and contraction and how they can be minimized. Some special exercises prepare the student for several of the more common welding jobs.

NEW WESTINGHOUSE STRUCTURAL STEEL BULLETIN

The revised edition of the Westinghouse bulletin on the Arc Welding of Structural Steel, No. SP 1879, brings together an interesting collection of up-to-date information on the arc welding of heavy steel structures. The booklet is well illustrated with pictures showing complete views and also details of some of the most important welded structures which have been built in recent years. Some information is given on the strength of arc welding and on the principles of designing for arc welding. A special section is devoted to the subject of testing and inspecting. The building code of the American Welding Society is included. Three pages are devoted to the subject of estimating costs, and three pages to bridge welding specifications.

NEW BOOKLET ON PROJECTION WELDING

"A. E. F. Projection Welding for Big Production" is the title of bulletin No. 60, recently issued by the American Electric Fusion Corp., 2610 Diversey Ave., Chicago, Ill. The first and back pages of this very novel booklet is covered with a metallic sheet which resembles gold leaf, and on this are printed in colors the title and signature and illustrations. The subject is introduced by a vivid illustration of the freckled face of a lad, together with the introductory comment, "Speaking of Multiple Spots." The principle of projection, or multiple, welding is explained in a few words. The C. D. type of welding machine is illustrated in colors with its features prominently pointed out, and detailed drawings of this machine are also shown.

NEW HANSEN ARC WELDING MANUAL

The Northwestern Manufacturing Co., Milwaukee, Wis., have just published an arc welding manual for the Hansen arc welder, written by Robert Notvest. The text comprises 71 pages of welding information with a 4 page index. The size is 6x9 in., and the book has a heavy paper binding. Starting with a brief history of arc welding, this text proceeds to outline the fundamentals of the arc welding process, then describes the Hansen arc welder, tells how to install it and maintain it. Arc welding accessories and wires are also discussed. Then follow some useful tables and data on the properties of iron and steel, the speed and cost of welding, and comparisons of various designs of welds. The book then proceeds to give instructions to beginners, and outlines eight complete lessons for developing skill in welding joints of different design and in different positions. Then follow discussions of carbon-arc welding and cutting, back-step welding, welding of cast iron, hard surfacing, welding of ferrous alloys, welding of non-ferrous metals, steel testing by the spark method, comparison of arc welded construction with cast iron construction, comparison of welded joints with riveted joints, etc. Several pages at the conclusion of the book are devoted to a collection of useful engineering data and tables. This manual is priced at $1.00 per copy.

LEAFLET DESCRIBES KEROSENE TORCHES

Kerosene torches which are suitable for preheating castings and other work for welding are described in circular No. 14, published by the Chausse Oil Burner Co., 1227 W. Beardsley Ave., Elkhart, Ind. Among the torches best suited for this work are those having capacities of 3, 5, and 14 gallons of kerosene. The two larger sizes are supplied with hose connections, and the latter requires compressed-air service for atomizing. These torches burn one gallon of fuel per hour and generate a maximum temperature of 1,800 deg. F. This leaflet also describes heaters for concrete mixers.

COPPER BRAZING IN PRODUCTION WORK

The principles and application of copper brazing in the production of many different types of articles are discussed in considerable detail in bulletin GEA-1291, issued by the General Electric Co., Schenectady, N. Y. The advantages of copper brazing in an atmosphere of hydrogen are described, and this method of brazing is compared with other methods both in operation and results. Information is given on the application of copper in various forms for this work, and cases are cited where brazing can be used with good results and also where it should not be attempted. Brazing furnaces and generators of furnace atmospheres are described, particular attention being given to "electrolene" as a gas for furnace atmospheres.

ILLUSTRATES STRUCTURAL-STEEL JOBS

A new 8-page folder recently issued by The Leake and Nelson Co., consulting and contracting welding engineers, of 203 Ash St., Bridgeport, Conn., shows a number of structural-steel jobs carried through by this organization, these ranging from large multi-story buildings to bridge repairs and steel pedestals for railroad bridges. Each project is briefly described, and particular emphasis is laid on the economy and reliability of welding when done by competent operators. This piece of literature from a corps of reputable engineers should be an important factor in refuting the notion that the welding of large structures is still in its "experimental" stage.

OXY-COAL-GAS LEAD-BURNING EQUIPMENT

A list of equipment to be used with oxygen cylinders and coal-gas drawn from the usual town mains, for lead burning, is contained in a catalog recently published by The British Oxygen Co., Ltd., Angel Road, Edmonton, N.18, England. Examples are shown of the use of this equipment in pipe and tank work, battery manufacture and repairs, and in decorative and ornamental work. Particularly interesting are illustrations of rain-water heads and panels with ornamental designs put on by lead burning.

CATALOG OF PREHEATING TORCHES AND OTHER HEATING EQUIPMENT

Kerosene-burning torches especially designed for preheating metal for welding are listed in a catalog of industrial oil- and gas-burning equipment, published by the Mahr Manufacturing Co., Minneapolis, Minn. These torches are supplied in capacities of 5 and 12 gal. of fuel and are each equipped with a hand pump for supplying compressed air for atomization. Filling funnel and strainer, air gage, quick detachable hose couplings, and a Mahr safety automatic shut-off valve are permanently attached. Data are given on weight, oil consumption, etc. Other torches of a general utility nature are described which also are recommended for preheating work in the welding shop.

THOMSON-GIBB BULLETIN FEATURES WIRE WELDER

A current bulletin of the Thomson-Gibb Electric Welding Co., Bay City, Mich., illustrates and describes what is called an "Automatic Fabric Welder," which is said to weld 151,000 square feet of fabric in a ten-hour day. The machine described is equipped with thirty-seven transformers for the welding of fabric as wide as twelve feet. Wires are fed to the machine from reels and are straightened by part of the mechanism of the machine, and the welded fabric after leaving the machine is approximately flat.

NEW ATOMIC-HYDROGEN BULLETIN

A description of the atomic-hydrogen process of welding, together with its application and the equipment used, is given in bulletin GEA-823C, issued by the General Electric Co., Schenectady, N. Y. This is a revision of the previous bulletin on the same subject. Operating characteristics are shown by curves, and ampere settings, welding speeds, and other data are given for various thicknesses of steel plate.

AGNEW ISSUES FOLDER ON SPOT WELDERS

Various types of spot welders are illustrated and engineering data supplied on each type, in a folder issued by the Agnew Electric Welder Co., of Milford, Mich. Among the information given are the capacity in thickness of metal, the transformer rating, throat depth, dimensions of horns and their separation and adjustment, weight, height to welding points, and number of steps of current regulation. Two of the welders described are for mounting on benches, a third is a multiple spot welder, and the remainder are of the floor pedestal type.

THE WELDING INDUSTRY ATTRACTS HIGH CALIBER MEN

The accompanying photograph is of Robert W. Lee, 29 years old. Mr. Lee was born in California, attended public schools in that state and is a graduate of the Gettysburg Military School.

After graduating from Gettysburg he secured an engi-

ROBERT W. LEE

neer's license and commenced his marine career as an engineer on private yachts. During his spare time as an enginer he intensively studied navigation and eventually obtained a master's certificate. After that he was master on many well known yachts and has had extensive cruising experience in the Mediterranean Sea, Caribbean Sea, Bermudas and also the Great Lakes and their tributary waters.

About a year ago Mr. Lee was married, but decided that a married man really had no place in sea going life, so he started investigating many different trades that would lead him into a remunerative career. After months of investigation he found welding had an appeal to him that other trades seemed to lack and also that it offered more apparent opportunities in sales and engineering fields than most of the other trades that he had investigated. He is now a student at The Cleveland School of Welding, Inc., Cleveland, Ohio.

Lee is going to start work as a welder and secure all the practical experience he can in various jobs and then apply himself to welding salesmanship and welding engineering.

R. P. TARBELL JOINS KINKEAD ORGANIZATION

Ray P. Tarbell recently became a member of the firm of Robert E. Kinkead, Inc., consulting welding engineers, Cleveland, Ohio. He was formerly Cleveland District Sales Manager of The Lincoln Electric Co. In this new position, Mr. Tarbell will be connected with a firm which has established a national reputation as specialists in a new division of consulting engineering work. Robert E. Kinkead, Inc., serve as welding engineering consultants for large steel companies,

RAY P. TARBELL

steel fabricators, and manufacturers of mechanical equipment. They also supervise the establishment of welding departments within industrial firms and direct the methods of welding procedure and control and the redesign of products for arc welded steel construction, a field in which Mr. Tarbell in his former capacity has been actively engaged for many years. As vice-president and secretary, Mr. Tarbell will aid Robert E. Kinkead, well-known authority on welding procedure and control, in his executive duties as president of the firm which bears his name. Mr. Tarbell entered the employ of The Lincoln Electric Company in 1918. He was afterward promoted to the sales force and later made District Sales Manager. He attended Dartmouth College.

LE TOURNEAU INCREASES FACTORY FORCE

The Le Tourneau Manufacturing Co., of Stockton, Calif., recently added 15 mechanics to their day force and put on a night crew. This is encouraging news during a time when retrenchment in forces seems to be the order of the day.

The increase was made necessary to take care of orders for the Le Tourneau line of heavy earth-moving machinery. Sufficient work is in sight to keep the plant busy until January.

The office force also has been increased by adding J. W. Le Tourneau, sales manager, and O. H. Barnhill, who handles the publicity.

The Le Tourneau line of massive welded scrapers, dumpcarts, bulldozers, rooters, and packers have been in great demand as the result of other contractors learning of the unusual success which R. G. Le Tourneau is having in using his own machines in completing difficult grading jobs in record time.

Just now Le Tourneau's men are loading a 12-yd. wagon

every 70 seconds, day and night, on a Feather River levee job for the federal government, using a 4-yd. welded bucket with a Bucyrus-Erie drag-line Diesel excavator.

WELDING PRODUCTS CORP. EXPANDING

An expansion program, planned by the Welded Products Corp., of Kansas City, Mo., is rapidly materializing, as evidenced by recent transactions which are now being announced.

The purchase of an eleven-acre industrial site in a district east of the present location touching the terminal tracks, is a recent development. Development of the property will not begin for about a year, as there are still two years remaining of the lease held by the Welded Products Corp. on the 50,000 sq. ft. of space it occupies at 17th St. and Cleveland Ave.

The "Welco" welder division of this company recently developed a number of improvements in their spot welders. The line includes types E, M, and G in the manually operated machines, and types D and K in the automatic welders. These range from 5 to 100 kw. in capacity. A complete test laboratory is maintained and an engineering department for the design and development of special dies and jigs for handling complicated welding problems.

U. C. C. LAUNCHES POWER PROJECT

Construction work is now under way on new hydro-electric and steam-electric power-plant developments of subsidiary companies of the Union Carbide and Carbon Corp., in the vicinity of Hawks Nest, Gauley Junction, and Boncar, W. Va. The total installed capacity of the two plants will be about 200,000 hp. Power output will be utilized by the proposed industrial plant of the Electro Metallurgical Co. at Boncar.

The hydroelectric development is being built by the New-Kanawha Power Co. and is located on the New River, between Hawks Nest and Gauley Junction. It will consist of a dam across New River, an intake, a power tunnel, surge tank, steel penstocks, and power house.

The dam will be built a little less than a mile below the Hawks Nest Station of the Chesapeake & Ohio Railway. It will be about 826 ft. long between abutments and will raise the water of New River about 60 ft. above low stage at the dam. From the pool above the dam, water will be diverted into penstocks by an intake and tunnel, the tunnel being about 16,250 ft. in length and 30 ft. in diameter. The penstocks will connect with the hydraulic turbines and power station. At about mid-length the tunnel will be provided with an intermediate surge basin and at its lower end with a surge tank of large dimensions.

The hydroelectric power house will contain four units, each rated at 35,000 hp., representing a total installed capacity of 140,000 hp. From the power house a transmission line will run a distance of about six miles to the industrial plant at Boncar where a power connection will be made with the proposed steam-electric power plant. It is estimated that an annual average of over 80,000 hp. will be delivered to the Boncar industrial plant from the hydroelectric station.

The contract for the construction of the dam, tunnel, and power house was let to the Rinehart & Dennis Co., Inc., on March 13, 1930, and work was commenced on March 30th. Completion is required and the entire development is expected to be ready for operation by March 13, 1932.

The steam-electric power plant is being built by the West Virginia Hydro-Electric Co. on the Kanawha River immediately adjacent to the site of the industrial plant at Boncar. It will consist of two steam turbo-generator units, each with a capacity of 22,500 kw., or a total capacity of 45,000 kw. of 60,000 hp. This plant will even out the irregularities of power supply which naturally occur in a hydroelectric power plant situated on a stream where the flow is not regulated. The contract for the design and construction of the steam electric power plant development was let to Ford, Bacon & Davis, Inc., on April 15, 1930, and it is expected that it will be finished about July 1, 1931.

The hydroelectric and steam-electric plants are expected to provide an average combined annual output of about 120,000 hp.

ENTERPRISING WELDER CONTRIBUTES WELDING ARTICLES TO LOCAL PAPER

Stephen M. Wells, Jr., of the City Welding Works, 103 N. Young St., Columbus, Ohio, is contributing a series of articles on welding subjects to the *Columbus Builder*, which is the official organ of the Columbus Builders' Exchange. He has already furnished articles on the subjects of pipe welding, structural welding and the welding of battledeck flooring, and has prepared additional articles for the series to be published in later issues of the *Columbus Builder*.

CLEVELAND WILL HAVE COURSE IN DESIGN FOR WELDING

Word has been received from Reg. K. Randall of the Educational Committee of the Cleveland Engineering Society that an unusual course is going to be presented to engineers, draftsmen and others interested in the designing of tool machinery using steel shapes, and welding as a means of fabrication. The course will also include some structural steel design and jig design.

Robert E. Kinkead, consulting engineer, will be in charge of the group, assisted by many other well known personages in the industry. This course will be sponsored by the John Huntington Polytechnic Institute, Cleveland, which was founded in 1917, its purpose being to give free instruction to residents of Cleveland employed in some of the applied arts or industrial occupations.

The classes start September 29th and will follow through one evening a week for thirteen weeks.

NEWS OF THE INDUSTRY

The city of Hamtramck, Mich., is building a new high school which will require 230 tons of steel. All the shop fabrication is to be arc welded construction. The steel contractors, who will do the welding, are the Palmer Bee Co., and the architects, V. C. Wetzel & Co., Cleveland, Ohio.

Roy Thomas, who operates The Torch Shop in Los Angeles, Calif., writes that he has recently enlarged his repair shop and added considerable new machinery. The present shop and show room will be built into show room and offices. He also states that business is showing a steady improvement at this time.

The Fager Hydraulic Hoist & Body Co., of 2121 S. San Pedro Ave., Los Angeles, Calif., is moving into its new plant at 2160 East 25th St. in that city. Three electric welding machines, together with several acetylene outfits, are in use in the plant, which manufactures truck bodies of all kinds, hydraulic hoists, and other similar machinery and equipment. A. H. Fager is president of the company.

C. F. Braun & Company, of Alhambra, Calif., recently installed three new Lincoln electric welders of the 300-amp. size. This company manufactures all kinds of oil-refinery apparatus and employs a large force of welders, both electric and acetylene.

S. A. Hurd, of Long Beach, Calif., who owns and operates a welding shop at 232 Columbia Ave., is moving into larger quarters situated next door to his present location. Specializing in all kinds of oil field welding is the main feature of the service rendered. Mr. Hurd is an "old-timer" in the Signal Hill field, having been there when the first well was brought in. He served in the early period of the field's development as driller, and then "tool-pusher," later working into the welding end of oil field work.

The Owl Welding Works, at 447 Washington Blvd., in the new oil field near Venice, Calif., was recently opened for business in that field. The owners are H. H. Harrison, O. Lewis, and J. W. Allison. The partnership will feature oil well digging bit service and general oil field welding work.

The St. John X-Ray Service Corp., 505 Fifth Ave., New York City, has installed what is said to be the first X-ray plant of its kind at the Barberton, Ohio, works of the Babcock & Wilcox Co. The photographic apparatus will be used primarily for routine inspection of welded seams in pressure vessels, heat exchangers, and similar equipment. Dr. Ancel St. John, president and technical director of the company which bears his name, says that the Babcock & Wilcox X-ray plant is the first of its kind and, in all probability, the most powerful as well.

The Alco Oil Tool Co., manufacturers of oil-well-drilling equipment with headquarters at 16516 Avalon Ave., near Compton, Calif., report the recent establishment of a branch shop at Hobbs, N. M. New Mexico is experiencing considerable oil development at this time, and the Alco company is enjoying a nice volume of business in that field. Several welders are employed in the company's plant there, in the hard-facing of digging bits, as well as servicing of other equipment manufactured by the company. Fred E. Bennett has charge of the New Mexico branch.

The Industrial Fuel and Supply Co., of Anaheim, Calif., is adding seven units to their plant No. 4, located in Santa Fe Springs. This addition increases the size of the plant to 36 units. Two hundred horsepower Bessemer engines are being installed, which with general enlarging of the plant, changing of lines, etc., has required considerable welding work. Both gas and electric welding is being employed.

Pointing out that Lorn Campbell, Jr., of the Harris Calorific Co. did the pricing on the new Harris line of low pressure welding and cutting equipment while making an airplane trip from the east to the west coast, the company claims that this is the first time that welding apparatus has been priced in the air.

The St. John X-Ray Service Corp. have announced the removal of their Laboratory to the Eveready Building, 30-20 Thomson Avenue, Long Island City, New York. In the new quarters they are prepared to handle anything which can be X-ray inspected, weighing up to five tons.

Thomas Gleason, salesman to the Mitchell Supply Co., Minneapolis, Minn., was hit and thrown through the left front window in the door of his car, by a careless driver. The accident occurred at 46th and Hiawatha Ave., Minneapolis. He suffers a fractured leg, broken neck bones, a very bad chest, and bruised right side of his face. He is not expected to travel before October 1st.

A new oil field at Venice, Calif., a distance of only about ten miles from Los Angeles, is showing rapid development at this time. In the neighborhood of one hundred and fifty rigs are now covering the field which, but a few months ago, had less than a half dozen. Over a score of wells are now producing a total of about 30,000 barrels of oil daily, with new wells adding to this figure every few days. This rapid development has meant considerable work for local oil-field welders in this district, and has had much to do with relieving the unemployment situation in the ranks of welders.

The Macco Construction Co., of Clearwater, Calif., is laying a 3-in. gas line and a 6-in. high-pressure line for the Bellview Oil Co., in the Santa Fe Springs oil field. The lines are a fraction over two miles in length, and both acetylene welded. These lines connect the company's wells with their tank farm in the south edge of the field. F. G. Cooney is in charge of the work.

Mr. Paulus, of the Paulus Welding Works, at 2904 Santa Fe Ave., Los Angeles, Calif., is closing his shop and expects to return to Milwaukee, Wis., from where he moved several months ago. Mr. Paulus expects to resume his trade in Milwaukee in the near future by opening a shop in that city.

The Cleveland Welding School, located at 2261 E. 14th St., Cleveland, Ohio, recently installed a new 400-amp. Hobart electric welding unit of the motor-generator type.

The Standard Machine & Welding Co. is the name of the new ownership of the Superior Oil Tool Co., of Signal Hill, Calif. The new company is composed of Charles Lyngle, Robert Tyner, and N. T. Beaver, formerly associated with the Cummins Welding Works, of Signal Hill. All the equipment is being remodeled and overhauled, and the new shop will be in operation in a very short time. Both acetylene and electric welding equipment, together with complete machine-shop equipment, will afford general oil-field machine and welding service of every description. The plant is located at 2894 Cherry Ave. and Mr. Lyngle is manager.

One of the very interesting exhibits at the West Michigan State Fair, held at Grand Rapids, Mich., Aug. 25th to 29th, was that of the Grand Rapids Welding & Supply Co. The items displayed were Phil-Gas, oxygen, acetylene, welding and cutting equipment, and liquid oxygen. An actual demonstration was given, at frequent intervals, of welding and cutting, with particular emphasis placed upon pipe welding. Also a live exhibition of the unusual things that can be done with liquid oxygen was one of the high lights of the exhibit and created a great deal of interest and amusement.

Announcement has been received of the removal of the general offices and storage yard of Steel and Tank Products Corp., of Chicago, to 4827 S. Whipple St., that city.

The welding shop of Currier & Ward, at 2995 American Ave., Long Beach, Calif., is to be closed in the near future. The owners are dissolving partnership, and it is reported that Mr. Currier will open a new shop in the Venice oil field in the near future.

J. M. Mathews, of the Harris Calorific Co., recently returned to Cleveland after a busy trip which took him to Rochester, Albany, Montreal, Boston, Baltimore, and Chicago.

The United Tank & Steel Products Co., of Los Angeles, Calif., recently moved from 621 N. Main St., to their new plant at 708 Date St. Their new location furnishes added working space, which with modern conveniences and equipment, makes the plant adequate for handling any size of job in their line. The company features general acetylene and electric welding of all kinds, and also manufactures

tanks, boilers, oil tools, and refinery equipment, as well as doing a repairing and manufacturing business in many other kinds of equipment. Just prior to the moving of the company into their new quarters, the company was incorporated, with Chas. E. Bishop as president and Chas. T. Watkins as vice-president and plant manager. Mr. Watkins is well known on the Pacific coast, having spent 15 years in the vicinity of Los Angeles in his line of work. He was for five years superintendent of the Southwest Welding & Manufacturing Co.

A recent advertisement of the South Chester Tube Co. in *The Oil and Gas Journal* illustrates a large plant devoted to oxy-acetylene welding of pipe into double lengths and describes a series of experiments which were made to demonstrate the fact that these welded double lengths do not leak and do not break under the severest tests.

A. E. Hood has opened a welding shop at 601 E. Fourth St., in Santa Ana, Calif. The shop will be known as the Class "A" Welding Works, and is equipped for both electric and gas welding. General welding work of all kinds will be featured. Mr. Hood was until recently connected with the Wilshire Oil Co. in the main shop of the company in Santa Fe Springs.

The name of the Cleveland Section of the American Welding Society appeared on the program of the Gordon-Bennet Air Races held in Cleveland, August 31st and September 1st, as one of the patrons.

Conner's Welding Works, of San Diego, Calif., recently moved from 420 West "B" St. to 1403 Broadway. Mr. Conner specializes in aluminum welding.

On September 11th, a meeting on the subject of Stainless Steels was held at the Cincinnati plant of Jos. T. Ryerson & Sons, Inc. Discussions at this meeting included the fabrication of various corrosion resisting steels and the most up-to-date methods of welding.

Report has been received of the organization of the Federal Welding Works at 262 North Walnut St., East Orange, N. J. It is said that this firm will specialize in electric welding.

A welding and auto repair shop was recently opened at 6511 Avalon Blvd., Los Angeles, Calif., featuring 24-hour service. The shop is owned and operated by F. A. Scribner and W. L. Everett, who will do general welding and motor repair work.

The Bias Flexible Shaft Co. recently moved to a new location at 22 Fortieth Ave., Long Island City, N. Y.

It is reported that Industrial Welding Alloys, Inc., a unit of Industrial Alloy Products Corp., of New York City, will operate a new plant at 8 Lester Ave., Newark, N. J., for the production of special metal alloys for welding.

The Pacific Pipe and Supply Co., of Los Angeles, Calif., recently installed a new 300-ampere Lincoln electric welder in their Papico heater department. This company manufactures the Papico line of water heaters. It is reported that they anticipate moving into new quarters in the near future.

In a paper read before the International Congress of Mining and Metallurgy at Liege, Belgium, in June, N. Petinot, of the Vanadium Corporation of America, spoke of the advantages of steel alloys containing vanadium, and mentioned particularly the superior properties of welds made in the vanadium steels. He stated further that the weld itself, the junction with the tube metal and the tube metal adjacent to the weld, all possess toughness and impact qualities of a superior order.

The growing importance of welding in the fabrication of parts of heavy machinery is indicated in an advertisement of the Carnegie Steel Co. in the September 4th issue of *Steel*. This advertisement shows Carnegie beams as used in machinery construction and gives an interesting summary of the advantages of welded steel in such construction.

Classified Ads

Help Wanted—75c per line, minimum 4 lines.
Jobs Wanted—4 lines free.
Other Ads—$1.00 per line, minimum 4 lines.
Count 8 words to line. Add 6 words for keyed address.

POSITIONS OPEN

St. Louis and Chicago Agents wanted by manufacturer of complete line of arc-welding products, including hydrogen-flame and gas-driven multiple-arc generators, all of which are extensively advertised. There is no combination known to the arc that this manufacturer cannot furnish. If you are a live wire, you will be made a proposition so attractive you can't afford to turn it down. Write the Electric Arc Cutting & Welding Co., Newark, N. J.

Distributors and Salesmen wanted in all sections of the country to represent us in the sale of Wesco coated and bare electrodes of certified analysis. An exceptional opportunity is open to parties of integrity and ability. Wesco Engineering & Sales Company, Wilkinsburg, Pa.

Equipment Service Men with thorough factory experience and training.

Able Inspectors of welding and cutting equipment in Production Department, must have draftsmen's experience and training.

Foremen, thoroughly experienced in the manufacture and development of welding and cutting equipment. Men with long experience and new ideas.

Sales Engineers, preferably with established territory connections.

The expansion policies of the Alexander Milburn Co. have created several desirable vacancies for qualified men in the above capacities. Address ALEXANDER MILBURN CO., 1416-1428 W. BALTIMORE ST., BALTIMORE, MD.

POSITIONS WANTED

Welder and Blacksmith, single, wants position in this or foreign country, and will stay indefinitely if position is permanent. Best of references. Address Box 281, The Welding Engineer.

(*Classified advertisements continued on page* 84.)